

## SEARCH REQUEST FORM

Scientific and Technical Information Center

Requester's Full Name: Andrew Wessman Examiner #: 78959 Date: 10/31/02  
 Art Unit: 1742 Phone Number 305-3163 Serial Number: 09/966 261  
 Mail Box and Bldg/Room Location: CPS 7D12 Results Format Preferred (circle): PAPER DISK E-MAIL

If more than one search is submitted, please prioritize searches in order of need.

\*\*\*\*\*

Please provide a detailed statement of the search topic, and describe as specifically as possible the subject matter to be searched. Include the elected species or structures, keywords, synonyms, acronyms, and registry numbers, and combine with the concept or utility of the invention. Define any terms that may have a special meaning. Give examples or relevant citations, authors, etc, if known. Please attach a copy of the cover sheet, pertinent claims, and abstract.

Title of Invention: High Purity Cobalt method of manufacturing thereof and high purity cobalt targets  
 Inventors (please provide full names): See Sheet

Earliest Priority Filing Date: 7/22/00

\*For Sequence Searches Only\* Please include all pertinent information (parent, child, divisional, or issued patent numbers) along with the appropriate serial number.

Please ignore claims 1, 2, 12, 13

Search process of claims 3-11

also search similar processes involving nickel

*[Handwritten signature]*

## STAFF USE ONLY

Searcher: Kokoma  
 Searcher Phone #: 308 3142  
 Searcher Location: 151C1700  
 Date Searcher Picked Up: 11/05/02  
 Date Completed: 11/05/02  
 Searcher Prep & Review Time: \_\_\_\_\_  
 Clerical Prep Time: \_\_\_\_\_  
 Online Time: \_\_\_\_\_

## Type of Search

NA Sequence (#) \_\_\_\_\_  
 AA Sequence (#) \_\_\_\_\_  
 Structure (#) \_\_\_\_\_  
 Bibliographic ☒  
 Litigation \_\_\_\_\_  
 Fulltext \_\_\_\_\_  
 Patent Family \_\_\_\_\_  
 Other \_\_\_\_\_

## Vendors and cost where applicable

STN ☒  
 Dialog \_\_\_\_\_  
 Questel/Orbit \_\_\_\_\_  
 Dr. Link \_\_\_\_\_  
 Lexis/Nexis \_\_\_\_\_  
 Sequence Systems \_\_\_\_\_  
 WWW/Internet \_\_\_\_\_  
 Other (specify) \_\_\_\_\_

WES0966861

=> d his

(FILE 'HOME' ENTERED AT 09:55:59 ON 05 NOV 2002)

FILE 'HCAPLUS' ENTERED AT 10:11:05 ON 05 NOV 2002

FILE 'HCAPLUS' ENTERED AT 11:02:06 ON 05 NOV 2002

ACT WES966/A

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L1 ( 1)SEA FILE=REGISTRY ABB=ON PLU=ON 7646-79-9  
L2 ( 1)SEA FILE=REGISTRY ABB=ON PLU=ON 7440-48-4  
L3 ( 2)SEA FILE=REGISTRY ABB=ON PLU=ON 7440-50-8 OR 17493-86-6  
L4 ( 846381)SEA FILE=HCAPLUS ABB=ON PLU=ON L2 OR COBALT OR CO OR COBALT I  
L5 ( 35595)SEA FILE=HCAPLUS ABB=ON PLU=ON L4(L) (PUR OR PREP OR IMF OR SP  
L6 ( 28453)SEA FILE=HCAPLUS ABB=ON PLU=ON L1 OR COBALT CHLORIDE OR COCL2  
L7 ( 1800)SEA FILE=HCAPLUS ABB=ON PLU=ON L5 AND L6  
L8 ( 1)SEA FILE=REGISTRY ABB=ON PLU=ON HYDROCHLORIC ACID/CN  
L9 ( 173)SEA FILE=HCAPLUS ABB=ON L7 AND (HYDROCHLORIC ACID OR HCL OR L8  
L10 ( 1023757)SEA FILE=HCAPLUS ABB=ON L3 OR COPPER OR CU  
L11 ( 32)SEA FILE=HCAPLUS ABB=ON L9 AND L10  
L12 ( 11)SEA FILE=HCAPLUS ABB=ON L11 AND METAL?/SC,SX  
L13 ( 40)SEA FILE=HCAPLUS ABB=ON L9 AND (PURIFYING OR SEPARATING OR ELU  
L14 ( 5)SEA FILE=HCAPLUS ABB=ON L13 AND ION EXCHANGE  
L15 ( 6)SEA FILE=HCAPLUS ABB=ON L13 AND (ION EXCHANGE OR HIGH TEMPERAT  
L16 ( 16)SEA FILE=HCAPLUS ABB=ON L12 OR L14 OR L15  
L17 ( 1)SEA FILE=REGISTRY ABB=ON PLU=ON NICKEL/CN  
L18 ( 2)SEA FILE=REGISTRY ABB=ON PLU=ON NICKEL CHLORIDE/CN  
L19 ( 47426)SEA FILE=HCAPLUS ABB=ON PLU=ON (L17 OR NI OR NICKEL) (L) (PREP  
L20 ( 17023)SEA FILE=HCAPLUS ABB=ON PLU=ON L18 OR NICKEL CHLORIDE OR NICL  
L21 ( 2185)SEA FILE=HCAPLUS ABB=ON PLU=ON L19 AND L20  
L22 ( 1)SEA FILE=REGISTRY ABB=ON PLU=ON HYDROCHLORIC ACID/CN  
L23 ( 207)SEA FILE=HCAPLUS ABB=ON PLU=ON L21 AND (L22 OR HYDROCHLORIC A  
L24 ( 101)SEA FILE=HCAPLUS ABB=ON PLU=ON L23 AND METAL?/SC,SX  
L25 ( 2)SEA FILE=REGISTRY ABB=ON PLU=ON 7440-50-8 OR 17493-86-6  
L26 ( 29)SEA FILE=HCAPLUS ABB=ON PLU=ON L24 AND (L25 OR COPPER OR CU)  
L27 ( 25)SEA FILE=HCAPLUS ABB=ON PLU=ON L26 NOT ELECTRODEP?  
L28 ( 6)SEA FILE=HCAPLUS ABB=ON PLU=ON L27 AND (ION EXCHANG? OR HIGH  
L29 21 SEA FILE=HCAPLUS ABB=ON PLU=ON L16 OR L28  
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FILE 'WPIX' ENTERED AT 11:04:06 ON 05 NOV 2002

FILE 'STNGUIDE' ENTERED AT 11:05:17 ON 05 NOV 2002

FILE 'WPIX' ENTERED AT 11:14:32 ON 05 NOV 2002

L30 11960 S (COBALT OR CO) (5A) (PURIF? OR MANUFAC? OR MAKE? OR MAKING OR P  
SET PLURAL OFF PERM  
L31 2529 S COBALT CHLORIDE OR COCL2  
L32 168 S L30 AND L31  
L33 8336 S (NICKEL OR NI) (5A) (PURIF? OR MANUFAC? OR MAKE? OR MAKING OR P  
L34 1760 S NICKEL CHLORIDE OR NICL2  
L35 224 S L33 AND L34  
L36 382 S L35 OR L32  
L37 1281538 S ION EXCHANG? OR RESIN? (2A) EXCHANGE OR HYDROCHLORIC ACID OR HC  
L38 126 S L37 AND L36  
L39 115 S L38 NOT ELECTROP?  
E JP2000-338288/PRN,AP

KOROMA 308 4290 EIC1700

WES0966861

L40 1 S E3  
L41 14 S L38 AND C22B023/IC  
L42 0 S L38 AND C22B03/IC  
L43 0 S L38 AND C22B003/IC  
L44 14 S L41 OR L43

FILE 'JAPIO' ENTERED AT 11:44:54 ON 05 NOV 2002  
L45 1 S L44

FILE 'METADEX' ENTERED AT 11:46:55 ON 05 NOV 2002  
L46 26 S L39  
L47 3236 S 46  
L48 26 S L46  
L49 7 S L46 AND 43/CC

=> set cost off  
SET COMMAND COMPLETED

=> file hcaplus  
FILE 'HCAPLUS' ENTERED AT 11:51:58 ON 05 NOV 2002  
USE IS SUBJECT TO THE TERMS OF YOUR STN CUSTOMER AGREEMENT.  
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FILE COVERS 1907 - 5 Nov 2002 VOL 137 ISS 19  
FILE LAST UPDATED: 3 Nov 2002 (20021103/ED)

This file contains CAS Registry Numbers for easy and accurate substance identification.

CAS roles have been modified effective December 16, 2001. Please check your SDI profiles to see if they need to be revised. For information on CAS roles, enter HELP ROLES at an arrow prompt or use the CAS Roles thesaurus (/RL field) in this file.

=> d que 129  
L1 ( 1)SEA FILE=REGISTRY ABB=ON PLU=ON 7646-79-9  
L2 ( 1)SEA FILE=REGISTRY ABB=ON PLU=ON 7440-48-4  
L3 ( 2)SEA FILE=REGISTRY ABB=ON PLU=ON 7440-50-8 OR 17493-86-6  
L4 ( 846381)SEA FILE=HCAPLUS ABB=ON PLU=ON L2 OR COBALT OR CO OR COBALT ION# OR "CO+"  
L5 ( 35595)SEA FILE=HCAPLUS ABB=ON PLU=ON L4 (L) (PUR OR PREP OR IMF OR SPN)/RL  
L6 ( 28453)SEA FILE=HCAPLUS ABB=ON PLU=ON L1 OR COBALT CHLORIDE OR COCL2  
L7 ( 1800)SEA FILE=HCAPLUS ABB=ON PLU=ON L5 AND L6  
L8 ( 1)SEA FILE=REGISTRY ABB=ON PLU=ON HYDROCHLORIC ACID/CN

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 L14 ( 5)SEA FILE=HCAPLUS ABB=ON L13 AND ION EXCHANGE  
 L15 ( 6)SEA FILE=HCAPLUS ABB=ON L13 AND (ION EXCHANGE OR HIGH TEMPERATURE OR HEAT)  
 L16 ( 16)SEA FILE=HCAPLUS ABB=ON L12 OR L14 OR L15  
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 L25 ( 2)SEA FILE=REGISTRY ABB=ON PLU=ON 7440-50-8 OR 17493-86-6  
 L26 ( 29)SEA FILE=HCAPLUS ABB=ON PLU=ON L24 AND (L25 OR COPPER OR CU)  
 L27 ( 25)SEA FILE=HCAPLUS ABB=ON PLU=ON L26 NOT ELECTRODEP?  
 L28 ( 6)SEA FILE=HCAPLUS ABB=ON PLU=ON L27 AND (ION EXCHANG? OR HIGH TEMP? OR HEAT)  
 L29 21 SEA FILE=HCAPLUS ABB=ON PLU=ON L16 OR L28

=> file wpix

FILE 'WPIX' ENTERED AT 11:52:34 ON 05 NOV 2002

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FILE LAST UPDATED: 31 OCT 2002 <20021031/UP>  
 MOST RECENT DERWENT UPDATE: 200270 <200270/DW>  
 DERWENT WORLD PATENTS INDEX SUBSCRIBER FILE, COVERS 1963 TO DATE

>>> SDI run number 70 for WPI was inadvertently processed with  
 a wrong ED/UP date resulting in empty answer sets.  
 Therefore SDI 70 will be rerun tonight. <<<

>>> SLART (Simultaneous Left and Right Truncation) is now  
 available in the /ABEX field. An additional search field  
 /BIX is also provided which comprises both /BI and /ABEX <<<

>>> PATENT IMAGES AVAILABLE FOR PRINT AND DISPLAY <<<

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[http://www.derwent.com/userguides/dwpi\\_guide.html](http://www.derwent.com/userguides/dwpi_guide.html) <<<

=> d que 144

L30 11960 SEA FILE=WPIX ABB=ON PLU=ON (COBALT OR CO) (5A) (PURIF? OR  
MANUFAC? OR MAKE? OR MAKING OR PREP? OR FABRIC?)  
L31 2529 SEA FILE=WPIX ABB=ON COBALT CHLORIDE OR COCL2  
L32 168 SEA FILE=WPIX ABB=ON L30 AND L31  
L33 8336 SEA FILE=WPIX ABB=ON (NICKEL OR NI) (5A) (PURIF? OR MANUFAC? OR  
MAKE? OR MAKING OR PREP? OR FABRIC?)  
L34 1760 SEA FILE=WPIX ABB=ON NICKEL CHLORIDE OR NICL2  
L35 224 SEA FILE=WPIX ABB=ON L33 AND L34  
L36 382 SEA FILE=WPIX ABB=ON L35 OR L32  
L37 1281538 SEA FILE=WPIX ABB=ON ION EXCHANG? OR RESIN?(2A)EXCHANGE OR  
HYDROCHLORIC ACID OR HCL OR HEAT OR HIGH TEMP? OR COPPER OR CU  
L38 126 SEA FILE=WPIX ABB=ON L37 AND L36  
L41 14 SEA FILE=WPIX ABB=ON L38 AND C22B023/IC  
L43 0 SEA FILE=WPIX ABB=ON L38 AND C22B003/IC  
L44 14 SEA FILE=WPIX ABB=ON L41 OR L43

=> file japio

FILE 'JAPIO' ENTERED AT 11:53:13 ON 05 NOV 2002  
COPYRIGHT (C) 2002 Japanese Patent Office (JPO)- JAPIO

FILE LAST UPDATED: 29 OCT 2002 <20021029/UP>  
FILE COVERS APR 1973 TO JUNE 28, 2002

>>> JAPIO has been reloaded on August 25 and saved answer sets  
will no longer be valid. SEE HELP RLO for details <<<

=> d que 145

L30 11960 SEA FILE=WPIX ABB=ON PLU=ON (COBALT OR CO) (5A) (PURIF? OR  
MANUFAC? OR MAKE? OR MAKING OR PREP? OR FABRIC?)  
L31 2529 SEA FILE=WPIX ABB=ON COBALT CHLORIDE OR COCL2  
L32 168 SEA FILE=WPIX ABB=ON L30 AND L31  
L33 8336 SEA FILE=WPIX ABB=ON (NICKEL OR NI) (5A) (PURIF? OR MANUFAC? OR  
MAKE? OR MAKING OR PREP? OR FABRIC?)  
L34 1760 SEA FILE=WPIX ABB=ON NICKEL CHLORIDE OR NICL2  
L35 224 SEA FILE=WPIX ABB=ON L33 AND L34  
L36 382 SEA FILE=WPIX ABB=ON L35 OR L32  
L37 1281538 SEA FILE=WPIX ABB=ON ION EXCHANG? OR RESIN?(2A)EXCHANGE OR  
HYDROCHLORIC ACID OR HCL OR HEAT OR HIGH TEMP? OR COPPER OR CU  
L38 126 SEA FILE=WPIX ABB=ON L37 AND L36  
L41 14 SEA FILE=WPIX ABB=ON L38 AND C22B023/IC  
L43 0 SEA FILE=WPIX ABB=ON L38 AND C22B003/IC  
L45 1 SEA FILE=JAPIO ABB=ON L41 OR L43

=> file metadex

FILE 'METADEX' ENTERED AT 11:53:38 ON 05 NOV 2002  
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FILE LAST UPDATED: 14 OCT 2002 <20021014/UP>  
FILE COVERS 1966 TO DATE.

=> d que 149

L30 11960 SEA FILE=WPIX ABB=ON PLU=ON (COBALT OR CO) (5A) (PURIF? OR

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MANUFAC? OR MAKE? OR MAKING OR PREP? OR FABRIC?)  
L31 2529 SEA FILE=WPIX ABB=ON COBALT CHLORIDE OR COCL2  
L32 168 SEA FILE=WPIX ABB=ON L30 AND L31  
L33 8336 SEA FILE=WPIX ABB=ON (NICKEL OR NI) (5A) (PURIF? OR MANUFAC? OR  
MAKE? OR MAKING OR PREP? OR FABRIC?)  
L34 1760 SEA FILE=WPIX ABB=ON NICKEL CHLORIDE OR NICL2  
L35 224 SEA FILE=WPIX ABB=ON L33 AND L34  
L36 382 SEA FILE=WPIX ABB=ON L35 OR L32  
L37 1281538 SEA FILE=WPIX ABB=ON ION EXCHANG? OR RESIN? (2A) EXCHANGE OR  
HYDROCHLORIC ACID OR HCL OR HEAT OR HIGH TEMP? OR COPPER OR CU  
L38 126 SEA FILE=WPIX ABB=ON L37 AND L36  
L46 26 SEA FILE=METADEX ABB=ON L38 NOT ELECTROP?  
L49 7 SEA FILE=METADEX ABB=ON L46 AND 43/CC

=> dup rem 129 144 145 149

FILE 'HCAPLUS' ENTERED AT 11:54:36 ON 05 NOV 2002  
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FILE 'METADEX' ENTERED AT 11:54:36 ON 05 NOV 2002  
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PROCESSING COMPLETED FOR L29  
PROCESSING COMPLETED FOR L44  
PROCESSING COMPLETED FOR L45  
PROCESSING COMPLETED FOR L49  
L50 42 DUP REM L29 L44 L45 L49 (1 DUPLICATE REMOVED)

=> d 150 1-42 all

L50 ANSWER 1 OF 42 HCAPLUS COPYRIGHT 2002 ACS  
AN 2002:270754 HCAPLUS  
DN 136:302890  
TI High-purity cobalt, manufacturing, and high-purity cobalt targets  
IN Uchikoshi, Masahito; Yokoyama, Norio; Kekesi, Tamas; Isshiki, Minoru  
PA Sony Corp., Japan  
SO Jpn. Kokai Tokkyo Koho, 10 pp.  
CODEN: JKXXAF  
DT Patent  
LA Japanese  
IC ICM C23C014-34  
ICS C22B003-42; C22B023-00; C22C019-07  
CC 76-12 (Electric Phenomena)  
Section cross-reference(s): 56

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 2002105633	A2	20020410	JP 2000-338288	20000929
	US 2002117025	A1	20020829	US 2001-966861	20010928
PRAI	JP 2000-338288	A	20000929		

AB The title high-purity Co is manufg. by (1) dissolving Cu-contg.

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course Co into an aq. HCl soln. to give an aq. 0.1-3 kmol/m<sup>3</sup> Co chloride soln., (2) mixing the Co chloride soln. with Co under inert gas feeding to make impurity Cu into monovalent Cu<sup>+</sup> in the soln., (3) passing the soln. through an cation exchanger to adsorb the Cu<sup>+</sup> to be removed, (4) evapg. to dry the aq. soln., and (5) heating at 623-873 K in H<sub>2</sub> atm. to give Co.

- ST cobalt purifn **copper** impurity removal cation exchange target  
manuf
- IT Electric circuits  
(cobalt, formation from sputtering target; high-purity cobalt and manufg. and high-purity cobalt targets)
- IT Sputtering targets  
(cobalt, purifn. of; high-purity cobalt and manufg. and high-purity cobalt targets)
- IT Cation exchangers  
(high-purity cobalt and manufg. and high-purity cobalt targets)
- IT Purification  
(of cobalt, by cation exchanging; high-purity cobalt and manufg. and high-purity cobalt targets)
- IT **7646-79-9P, Cobalt chloride**, preparation  
RL: PNU (Preparation, unclassified); RCT (Reactant); **PREP (Preparation)**; RACT (Reactant or reagent)  
(high-purity **cobalt** and manufg. and high-purity **cobalt** targets)
- IT **7440-48-4P, Cobalt**, preparation  
RL: **PUR (Purification or recovery)**; **PREP (Preparation)**  
(purifn. by ion exchanging; high-purity **cobalt** and manufg. and high-purity **cobalt** targets)
- IT **7440-50-8, Copper**, processes **17493-86-6, Copper(1+)**, processes  
RL: REM (Removal or disposal); PROC (Process)  
(removal, by cation exchanging; high-purity cobalt and manufg. and high-purity cobalt targets)

L50 ANSWER 2 OF 42 HCAPLUS COPYRIGHT 2002 ACS DUPLICATE 1

AN 2001:17959 HCAPLUS

DN 134:59386

TI Method for manufacture of high-purity cobalt

IN Nagao, Junko; Sekine, Susumu; Tanaka, Minoru; Yokoyama, Hidechika

PA Kojundo Kagaku Kenkyusho K. K., Japan

SO Jpn. Tokkyo Koho, 4 pp.

CODEN: JTXXFF

DT Patent

LA Japanese

IC ICM C22B023-00

ICS C01G051-08; C25C001-08

CC 54-3 (Extractive Metallurgy)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 3122948	B1	20010109	JP 1999-224389	19990702
	JP 2001020021	A2	20010123		
AB	The method comprises: (1) removal of Fe, Zn, Sn, etc. from a <b>CoCl<sub>2</sub></b> soln. contg. 2-6M <b>HCl</b> by anionic <b>ion exchange</b> , (2) removal of Ni <sup>2+</sup> , Ca <sup>2+</sup> , Na <sup>+</sup> , Mg <sup>2+</sup> , etc. from the soln. by solvent <b>extn.</b> with an amino org. solvent and stripping, and (3) redn. to obtain Co by drying the soln. to dryness and reducing in flowing H or by electrolysis. The amino org. solvent is trialkylamine, dialkylamine, or				

monoalkylamine.

ST cobalt purifn ion exchange solvent extn

IT **Ion exchange**  
Reduction  
Solvent **extraction**  
(manuf. of high-purity cobalt by ion exchange,  
solvent **extn.**, and redn. with hydrogen or by electrolysis)

IT 106-20-7, Di-2-ethylhexylamine  
RL: TEM (Technical or engineered material use); USES (Uses)  
(extg. agent; manuf. of high-purity cobalt by ion  
**exchange**, solvent **extn.**, and redn. with hydrogen or  
by electrolysis)

IT 54693-66-2, SA 10  
RL: TEM (Technical or engineered material use); USES (Uses)  
(ion-exchanger; manuf. of high-purity cobalt by ion  
**exchange**, solvent **extn.**, and redn. with hydrogen or  
by electrolysis)

IT **7440-48-4P, Cobalt**, preparation  
RL: **PUR (Purification or recovery); PREP (Preparation)**  
(manuf. of high-purity **cobalt** by ion  
**exchange**, solvent **extn.**, and redn. with hydrogen or  
by electrolysis)

L50 ANSWER 3 OF 42 METADEX COPYRIGHT 2002 CSA

AN 2001(12):43-595 METADEX

TI Anion-exchange separation in hydrochloric acid solutions for the ultrahigh purification of cobalt.

AU Kekesi, T. (University of Miskolc); Uchikoshi, M. (Fine Materials (Japan)); Mimura, K. (Tohoku University); Isshiki, M. (Tohoku University)

SO Metallurgical and Materials Transactions B (Aug. 2001) 32B, (4), 573-582, Numerical Data, Spectra, Graphs, 20 ref.  
ISSN: 1073-5615

DT Journal

CY United States

LA English

AB Recent applications in advanced electronics have increased the practical importance of ultrahigh-purity cobalt. Anion exchange in HCl media is considered an efficient alternative to the combination of the conventional purification methods. Anion-exchange distribution functions have been determined for cobalt and the main impurity elements by the technique of batch equilibration. Spectrophotometric and elution studies confirmed the established anion-exchange behavior patterns. Based on the new and the available distribution functions, combined with the assessment of thermodynamic stability, a procedure of anion-exchange separation has been devised to eliminate virtually all the impurities from the cobalt-chloride solution. The major shortcoming of previously proposed anion-exchange procedures-failing to separate copper sufficiently-has been corrected by the introduction of a preliminary step under reduced conditions, removing copper from the solution by sorption in the monovalent state. The rest of the impurities are eliminated in a second anion-exchange step by applying rinsing and elution stages under oxidizing conditions. The optimum parameters of the procedure have been determined according to performance characteristics (purification ratios, yields, and volume efficiencies) derived from the analysis of elution curves obtained with laboratory-scale ion-exchange columns. Special computer programs have been developed to facilitate thermodynamic simulation, analytical correction, and data processing.

CC 43 Refining and Purification



CT Journal Article; Cobalt: Refining; Hydrometallurgy; Separation; Ion  
 ET Cl\*H; HCl; H cp; cp; Cl cp

L50 ANSWER 4 OF 42 METADEX COPYRIGHT 2002 CSA  
 AN 2001(10):43-517 METADEX  
 TI Study on organic phase composition and extractive process for purifying  
 nickel chloride solution with N235.  
 AU Chen, S. (Central-South University of Technology (China)); Wang, W.-X.  
 (Central-South University of Technology (China)); Li, Q.-H. (Central-South  
 University of Technology (China)); Liu, Z.-H. (Central-South University of  
 Technology (China)); Zhang, D.-M. (Central-South University of Technology  
 (China)); Wang, R.-Z. (General Research Institute of Nonferrous Metals  
 (Beijing))  
 SO Mining and Metallurgical Engineering (China) (Mar. 2001) 21, (1), 56-58,  
 Graphs, 3 ref.  
 ISSN: 0253-6099  
 DT Journal  
 CY China  
 LA Chinese  
 AB In the experiments of purifying the solution of chlorine leaching and  
 removing iron from nickel concentrate with N235, the effects of organic  
 phase composition on purifying efficiency have been studied. From the  
 results obtained, the optimal organic phase composition is found to be 25%  
 N235+ 12% isomeric alcohol + 63% sulfonic kerosene (V/V) and the  
 saturated content of cobalt in organic phase is 8 g/L. And then the serial  
 experiment is carried out. The results show that at the given organic  
 phase composition, the purified solution contains  $\rho(\text{Ni}) > 200 \text{ g/L}$ ,  $\rho(\text{Ni})/\rho(\text{Co}) > 50000$  and the contents of Cu, Fe, Mn, Zn meet the  
 technical criterion of 1\* nickel electrolyte. The cobalt chloride solution  
 contains  $\rho(\text{Co}) > 110 \text{ g/L}$ ,  $\rho(\text{Co})/\rho(\text{Ni}) > 5000$  and the enrichment  
 of cobalt has been achieved. The technical process is simple, stable and  
 reliable.

CC 43 Refining and Purification  
 CT Journal Article; Nickel: Extraction; Spent liquors; Purification;  
 Leaching; Chlorides  
 ET V; Ni; Cu; Fe; Mn; Zn; Co

L50 ANSWER 5 OF 42 HCAPLUS COPYRIGHT 2002 ACS  
 AN 2000:38006 HCAPLUS  
 DN 132:95993  
 TI Manufacture of high-purity cobalt solutions by removing impurities  
 IN Imamura, Masaki; Makino, Susumu; Tsuchida, Naoyuki; Takaishi, Kazuyuki;  
 Ozaki, Yoshitomo  
 PA Sumitomo Metal Mining Co., Ltd., Japan  
 SO Jpn. Kokai Tokkyo Koho, 9 pp.  
 CODEN: JKXXAF  
 DT Patent  
 LA Japanese  
 IC ICM C22B023-00  
 CC 54-2 (Extractive Metallurgy)  
 FAN.CNT 1

PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
JP 2000017347	A2	20000118	JP 1998-207252	19980707

AB The high-purity Co soln. is manufd. by following steps; (1) oxidn. of the  
 soln. contg. Fe, Mn, Zn, Ca, and Cu as impurities at  
 oxidn.-redn. potential .gtoreq.600 mV (based on Ag/AgCl std. electrode)

and pH .gtoreq.4 and then neutralization for removing pptn. of Fe, Mn, and **Cu**; (2) solvent extn. of Zn, Ca, and small amt. of remaining impurities with alkylphosphoric acid; (3) washing the org. phase contg. impurities and a part of Co with an aq. soln. for recovery of Co; (4) and then reverse extn. of impurities in the org. phase with a mineral acid for regenerating the org. phase. Also claimed manuf. steps contain (1') oxidn. of the Co soln. contg. Fe, Mn, Zn, Ca, and **Cu** as impurities at oxidn.-redn. potential .gtoreq.600 mV and pH .ltoreq.4 , neutralization for removing pptn. of Fe, Mn, and a part of **Cu**, and then keeping at pH .gtoreq.4 for removing pptn. of most **Cu**, (2), (3), and then (4). The method provides efficient removal of impurities.

ST cobalt soln purifn oxidn solvent extn; alkylphosphoric acid solvent extn  
cobalt soln

IT Oxidation

Solvent extraction

(oxidn. and extn. with alkylphosphoric acid in manuf. of high-purity cobalt solns. by removing impurities)

IT 145686-35-7, Clean Sol G

RL: NUU (Other use, unclassified); USES (Uses)

(extn. solvents; oxidn. and extn. with alkylphosphoric acid in manuf. of high-purity cobalt solns. by removing impurities)

IT 7542-09-8, Cobalt carbonate

RL: NUU (Other use, unclassified); USES (Uses)

(neutralizing agents; oxidn. and extn. with alkylphosphoric acid in manuf. of high-purity cobalt solns. by removing impurities)

IT 7782-50-5, Chlorine, uses 7790-92-3, Hypochlorous acid 10028-15-6, Ozone, uses

RL: NUU (Other use, unclassified); USES (Uses)

(oxidizing agents; oxidn. and extn. with alkylphosphoric acid in manuf. of high-purity cobalt solns. by removing impurities)

IT 7440-48-4P, Cobalt, preparation 7646-79-9P,

Cobalt chloride, preparation

RL: IMF (Industrial manufacture); PUR (Purification or recovery); PREP (Preparation)

(oxidn. and extn. with alkylphosphoric acid in manuf. of high-purity cobalt solns. by removing impurities)

IT 298-07-7

RL: NUU (Other use, unclassified); USES (Uses)

(oxidn. and extn. with alkylphosphoric acid in manuf. of high-purity cobalt solns. by removing impurities)

IT 7439-89-6, Iron, processes 7439-96-5, Manganese, processes

7440-50-8, Copper, processes 7440-66-6, Zinc,

processes 7440-70-2, Calcium, processes

RL: REM (Removal or disposal); PROC (Process)

(removal of; oxidn. and extn. with alkylphosphoric acid in manuf. of high-purity cobalt solns. by removing impurities)

IT 7647-01-0, Hydrochloric acid, uses

RL: NUU (Other use, unclassified); USES (Uses)

(washing and reverse-extn. with; oxidn. and extn. with alkylphosphoric acid in manuf. of high-purity cobalt solns. by removing impurities)

L50 ANSWER 6 OF 42 WPIX (C) 2002 THOMSON DERWENT

AN 2001-135682 [14] WPIX

DNC C2001-039647

TI Cobalt concentrate processing involves dissolving initial raw material in **hydrochloric acid**, extraction of iron, treating with salting-out agent, and cobalt extraction.

WES0966861

DC M25  
IN DYAKOVA, L V; ILENOK, A A; KLYUSHNIKOV, M I; SKLOKIN, L I  
PA (ILEN-I) ILENOK A A; (KLYU-I) KLYUSHNIKOV M I  
CYC 1  
PI RU 2158777 C1 20001110 (200114)\* C22B023-00 <--  
ADT RU 2158777 C1 RU 2000-104632 20000228  
PRAI RU 2000-104632 20000228  
IC ICM C22B023-00  
AB RU 2158777 C UPAB: 20010312

NOVELTY - Method includes dissolving initial raw material in **hydrochloric acid**, extraction of iron from solution, introduction of salting-out agent into solution **purified** from iron, **cobalt** extraction from obtained solution with salts of tertiary amines or quaternary ammonium bases with subsequent washing and re-extraction of **cobalt** to obtain of **purified cobalt** salt in re-extract and **purified nickel** salt in raffinate.

DETAILED DESCRIPTION - Initial raw material is preliminarily roasted. Salting-out agent is used in form of **NiCl2**. Extraction separation of cobalt and nickel is accomplished in two stages. In the first stage, one part of cobalt is extracted with maintenance of equilibrium concentration of **CoCl2** in raffinate equaling 20-80 g/l, and in the second stage, remaining cobalt is extracted from raffinate of the first stage extraction preliminarily evaporated to concentration of **NiCl2** equaling 400-500 g/l.

USE - Technology of cobalt concentrate processing; applicable in production of compounds of cobalt and associated metals, such as nickel, iron, **copper**.

ADVANTAGE - Higher degree of cobalt recovery; liberation of free chloride in dissolving procedure is prevented; low-cost and ecologically clean process. 8 cl

Dwg.0/0

FS CPI  
FA AB  
MC CPI: M25-A02; M25-B04; M25-G11

L50 ANSWER 7 OF 42 HCAPLUS COPYRIGHT 2002 ACS

AN 1999:728011 HCAPLUS

DN 131:324559

TI Manufacture of fine powder by hydrolysis or reduction of chlorides

IN Tsugita, Yasuhiro; Ishiyama, Naoki

PA Sumitomo Metal Mining Co., Ltd., Japan

SO Jpn. Kokai Tokkyo Koho, 6 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM C01G030-00

ICS B01J019-00

CC 49-3 (Industrial Inorganic Chemicals)

Section cross-reference(s): 54

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	---	-----	-----	-----
PI	JP 11314917	A2	19991116	JP 1998-125649	19980508
AB	The title fine powder is manufd. from chloride vapor by reacting with steam or a H gas at <b>high temp.</b> for hydrolysis or redn. and then solid-gas sepn. of resulting fine powder from a <b>HCl</b> gas for recovery. The process is esp. suitable for manuf. of Sb oxide powder				

KOROMA 308 4290 EIC1700

from Sb chlorides or manuf. of metal powder from metal chlorides.

ST steam hydrolysis metal chloride powder manuf; hydrogen redn metal chloride powder manuf

IT Hydrolysis  
Reduction  
Steam  
(manuf. of fine powder by hydrolysis or redn. of metal chlorides)

IT Chlorides, reactions  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(manuf. of fine powder by hydrolysis or redn. of metal chlorides)

IT **7647-01-0P**, Hydrogen chloride, preparation  
RL: BYP (Byproduct); PREP (Preparation)  
(byproduct; manuf. of fine powder by hydrolysis or redn. of metal chlorides)

IT 1313-99-1P, **Nickel** oxide, preparation 1327-33-9P, Antimony oxide **7440-02-0P**, **Nickel**, preparation 7440-22-4P, Silver, preparation **7440-50-8P**, **Copper**, preparation  
RL: **IMF (Industrial manufacture)**; **PREP (Preparation)**  
(manuf. of fine powder by hydrolysis or redn. of metal chlorides)

IT 1344-67-8, **Copper** chloride **7718-54-9**, **Nickel** chloride, reactions 7783-90-6, Silver chloride, reactions 174141-46-9, Antimony chloride  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(manuf. of fine powder by hydrolysis or redn. of metal chlorides)

IT 1333-74-0, Hydrogen, reactions  
RL: RCT (Reactant); RACT (Reactant or reagent)  
(reducing agents; manuf. of fine powder by hydrolysis or redn. of metal chlorides)

L50 ANSWER 8 OF 42 WPIX (C) 2002 THOMSON DERWENT

AN 1999-545129 [46] WPIX

DNN N1999-404330 DNC C1999-159539

TI Fine **nickel** powder **preparation** for internal electrode of laminated ceramic capacitor - involves performing solid phase reduction of **nickel chloride** with alkaline earth metal or alkali metal.

DC L03 M22 P53 V01

PA (SUMM) SUMITOMO METAL MINING CO

CYC 1

PI JP 11236631 A 19990831 (199946)\* 7p C22B023-02 <--

ADT JP 11236631 A JP 1998-57448 19980223

PRAI JP 1998-57448 19980223

IC ICM **C22B023-02**  
ICS B22F009-20

AB JP 11236631 A UPAB: 19991221  
NOVELTY - The solid phase reduction of **NiCl2** with alkaline earth metals like magnesium, barium, calcium and strontium or alkali metals like lithium, sodium and potassium is done to **prepare nickel** powder.  
DETAILED DESCRIPTION - An INDEPENDENT CLAIM is also included for fine nickel powder composition.  
USE - For internal electrode of laminated ceramic capacitor.  
ADVANTAGE - The reduction process provides high crystalline nickel powder, which can be sintered at **high temperature**.  
Dwg.0/1

FS CPI EPI GMPI

FA AB

MC CPI: L03-B03; M22-H01

L50 ANSWER 9 OF 42 WPIX (C) 2002 THOMSON DERWENT  
 AN 1999-267683 [23] WPIX  
 DNC C1999-079681  
 TI De-**copper** electrolyzer for high purity **nickel**  
**manufacture** - reduces bivalent **copper** ratio by reducing  
**copper** ion in **nickel chloride** solution,  
 followed by electrolytic winning of **copper**.  
 DC M25 M28  
 PA (SUMM) SUMITOMO METAL MINING CO  
 CYC 1  
 PI JP 11080986 A 19990326 (199923)\* 6p C25C001-12  
 ADT JP 11080986 A JP 1997-254228 19970903  
 PRAI JP 1997-254228 19970903  
 IC ICM C25C001-12  
 ICS **C22B023-06**  
 AB JP 11080986 A UPAB: 19990616  
 NOVELTY - Chlorine leaching of nickel is performed to metal sulfide  
 containing **copper** used as raw material. Electrolytic winning of  
 nickel is performed. The **copper** ion in **nickel**  
**chloride** solution with **copper** is reduced, thereby  
 reducing bivalent **copper** ratio. The electrolytic refining of  
**copper** is performed after that.  
 USE - Used for removing **copper** from **nickel**  
**chloride** solution used in high purity **nickel**  
**manufacture**.  
 ADVANTAGE - Maintains productive efficiency of nickel by performing  
 leaching of nickel. DESCRIPTION OF DRAWING(S) - The figure shows the  
 schematic arrangement of the de-**copper** electrolyzer.  
 Dwg.1/7  
 FS CPI  
 FA AB; GI  
 MC CPI: M25-B; M25-G19; M28-A

L50 ANSWER 10 OF 42 WPIX (C) 2002 THOMSON DERWENT  
 AN 1996-426297 [43] WPIX  
 DNN N1996-358904 DNC C1996-134370  
 TI Prodn. of pure cobalt for sputtering targets for electronics use -  
 comprises contacting acidic aq. soln. of **cobalt chloride**  
 contg. impurity elements with anion **exchange resin**,  
 eluting cobalt from resin etc..  
 DC L03 M13 M25 M28 U11 V05 X25  
 IN SHINDO, Y; SUZUKI, T  
 PA (NIHA) JAPAN ENERGY CORP  
 CYC 3  
 PI DE 19609439 A1 19960919 (199643)\* 10p C25C001-08  
 JP 08253888 A 19961001 (199649) 4p C25C001-08  
 US 5667665 A 19970916 (199743) 7p C25C001-08  
 JP 09227967 A 19970902 (199745) 7p C22B023-06 <--  
 US 5810983 A 19980922 (199845) C22C019-07  
 JP 3065242 B2 20000717 (200039) 7p C22B023-06 <--  
 ADT DE 19609439 A1 DE 1996-19609439 19960311; JP 08253888 A JP 1995-80831  
 19950314; US 5667665 A US 1996-615005 19960312; JP 09227967 A JP  
 1996-60362 19960223; US 5810983 A Div ex US 1996-615005 19960312, US  
 1997-790033 19970128; JP 3065242 B2 JP 1996-60362 19960223  
 FDT US 5810983 A Div ex US 5667665; JP 3065242 B2 Previous Publ. JP 09227967  
 PRAI JP 1996-60362 19960223; JP 1995-80831 19950314  
 IC ICM **C22B023-06**; C22C019-07; C25C001-08

ICS C23C014-14; C23C014-34; C25C007-04  
ICA H01L021-3205  
AB DE 19609439 A UPAB: 19961025  
Process for producing highly pure Co comprises: (a) contacting an aq. soln. of **cobalt chloride** having a **HCl** acid concn. of 7 - 12 N and contg. at least Fe and / or Ni as impurities with an **ion exchange resin** so that the Co is adsorbed by the resin; (b) eluting the Co using 1 - 6 N **HCl** acid as eluent; (c) evaporating the soln. contg. the eluted Co and drying or concentrating in another way and producing a cleaned aq. soln. of **cobalt chloride** having a pH of 0 - 6; and (d) electrolytically refining using the **cobalt chloride** aq. soln. as electrolyte.  
Also claimed are: (i) a process as above contg. a further step before the electrolytic refining of (d') removing organic contaminants from the cleaned **cobalt chloride** aq. soln. using activated charcoal; (ii) a process as above in which the original aq. soln. of **cobalt chloride** contains additional impurities, namely alkali metals like K and Na, and radioactive metals such as U and Th; and (iii) sputtering targets made of highly pure Co having content of impurity elements as follows: Na 0.05 ppm or less; K 0.05 ppm or less; Fe 1 ppm or less; Ni 1 ppm or less; Cr 1 ppm or less; U 0.01 ppb or less; Th 0.01 ppb or less; C 50 ppm or less or 10 ppm or less; and O 100 ppm or less.  
USE - Prodn. of highly pure cobalt for sputtering targets for prodn. of VLSI electrodes, conductors and wirings, films, etc..  
ADVANTAGE - The cobalt produced has a purity of 5 N (99.999%) or higher having min. amts. of alkali metals, radioactive metals and transition metals. Radioactive elements cause software failure of device elements due to alpha-particles being given off. Alkali metals move easily in gate insulating films and cause impairment of MOS-LSI boundary layer properties.  
Dwg.0/0  
FS CPI EPI  
FA AB  
MC CPI: L03-H04D; L04-C10A; L04-C11C; M13-G02; M25-B03; M25-G11; M28-A  
EPI: U11-C05C2; U11-C09A; V05-F04B5C; V05-F05C1; V05-F08D1A; X25-A04  
L50 ANSWER 11 OF 42 HCAPLUS COPYRIGHT 2002 ACS  
AN 1996:661915 HCAPLUS  
DN 125:334741  
TI The influence of solvent on the extraction of some non-ferrous metals by aliphatic non-chelating aldoximes  
AU Bezrukova, N. P.; Taraban'ko, V. E.; Fleitlich, I. Ur.; Kolesnichenko, G. V.  
CS Inst. Chem. Nat. Org. Mater., Siberian Branch Russia Acad. Sci., Krasnoyarsk, 660036, Russia  
SO Solvent Extraction and Ion Exchange (1996), 14(6), 1017-1036  
CODEN: SEIEDB; ISSN: 0736-6299  
PB Dekker  
DT Journal  
LA English  
CC 54-2 (Extractive **Metallurgy**)  
Section cross-reference(s): 68  
AB The influence of different solvents on the extn. ability of aliph. nonchelating aldoximes with respect to **CuCl<sub>2</sub>**, **NiCl<sub>2</sub>** and **CoCl<sub>2</sub>** has been investigated with heptanaloxime as an example. The effect of carbon tetrachloride, toluene, chloroform, 1,2-dichloroethane, caprylic acid on syn-antiisomerization and aggregation of heptanaloxime has been

studied and the consts. of these processes have been calcd. It was aldoxime anti-isomer that formed the extd. complex with metals. The equation of state of nonchelating aldoximes in the extn. systems has been deduced. Taking into account the processes which occur in the org. and aq. phases, the effective extn. consts. have been computed for extn. of metals from **hydrochloric acid** solns. by heptanaloxime in the different solvents. Their values decrease in the order: CCl<sub>4</sub>>toluene.apprxeq.chloroform>1,2-dichloroethane. For chlorine substituted hydrocarbons the correlations between ET parameter of the solvent and extn. const. have been established.

- ST heptanaloxime solvent extn nonferrous metal; **copper** extn heptanaloxime solvent; nickel extn heptanaloxime solvent; cobalt extn heptanaloxime solvent
- IT 629-31-2, Heptanaloxime  
RL: NUU (Other use, unclassified); USES (Uses)  
(solvent effect on the extn. of nonferrous metals by aliph. nonchelating aldoximes)
- IT 56-23-5, Carbon tetrachloride, properties 67-66-3, Chloroform, properties 107-06-2, 1,2-Dichloroethane, properties 108-88-3, Toluene, properties 124-07-2, Caprylic acid, properties  
RL: NUU (Other use, unclassified); PRP (Properties); USES (Uses)  
(solvent effect on the extn. of nonferrous metals by aliph. nonchelating aldoximes)
- IT 7440-02-0P, Nickel, preparation 7440-48-4P, **Cobalt**, preparation 7440-50-8P, **Copper**, preparation  
RL: **PUR (Purification or recovery)**; **PREP (Preparation)**  
(solvent effect on the extn. of nonferrous metals by aliph. nonchelating aldoximes)
- L50 ANSWER 12 OF 42 HCAPLUS COPYRIGHT 2002 ACS  
AN 1996:157312 HCAPLUS  
DN 124:237854  
TI Heavy metals in the environment. Part VI: Recovery of cobalt values from spent cobalt/manganese bromide oxidation catalysts  
AU Clark, S. J.; Donaldson, J. D.; Khan, Z. I.  
CS Department of Chemistry, Brunel University, Uxbridge, London, UB8 3PH, UK  
SO Hydrometallurgy (1996), 40(3), 381-93  
CODEN: HYDRDA; ISSN: 0304-386X  
PB Elsevier  
DT Journal  
LA English  
CC 54-2 (Extractive **Metallurgy**)  
AB Cobalt is recovered from a series of spent cobalt/manganese bromide oxidn. catalysts contg. 27-31% Co, 25-33% Mn, 0-14% Fe together with Cr, **Cu** and Ni. While ammoniacal leaching in the presence of reducing agents can be used to ext. cobalt, the process has to be sep. optimized for each sample. Leaching with 4 M **HCl** at 80.degree.C for 4 h, however, proved successful for all the catalysts. A method of successive neutralization is used for the sepn. of cobalt from the acid solns. Addn. of solid NaOH to pH 2 removes Fe and Cr as hydroxide, while addn. of ammonia to pH 10 ppts. manganese oxide from an aerated soln. leaving Co as a CoIII hexaammine complex. Cobalt can be recovered from this soln. by chem. or electrochem. processes. After crystn. the complex is converted to anhyd. **cobalt chloride** by heating it to 320.degree.C or to Co<sub>2</sub>O<sub>3</sub> by roasting it in air at 500.degree.C. Either of these materials may be readily converted into other cobalt chems. Alternatively, fluidized bed cell electrolysis of the CoIII complex soln. yields cobalt with purity >99.5%.

ST cobalt recycling catalyst acid leaching  
 IT Waste solids  
     (oxidn. catalyst; recycling of cobalt from spent oxidn. catalysts by  
     leaching with **hydrochloric acid**)  
 IT Recycling  
     (recycling of cobalt from spent oxidn. catalysts by leaching with  
     **hydrochloric acid**)  
 IT Catalysts and Catalysis  
     (waste; recycling of cobalt from spent oxidn. catalysts by leaching  
     with **hydrochloric acid**)  
 IT 7440-48-4P, Cobalt, preparation  
     RL: PUR (Purification or recovery); PREP (Preparation)  
     (recycling of cobalt from spent oxidn. catalysts by leaching  
     with **hydrochloric acid**)  
 IT 7647-01-0, Hydrochloric acid, reactions  
     RL: RCT (Reactant); RACT (Reactant or reagent)  
     (recycling of cobalt from spent oxidn. catalysts by leaching with  
     **hydrochloric acid**)

L50 ANSWER 13 OF 42 METADEX COPYRIGHT 2002 CSA  
 AN 1997(9):43-260 METADEX  
 TI Preparation of cobalt acetate from cobalt chloride by ion exchange.  
 AU Ying, J. (Tsinghua University); Han, H. (Institute of Tianjin  
 Petrochemical); Bao, F. (Tsinghua University); Zhu, D. (Tsinghua  
 University); Liu, Y. (Tsinghua University); Wang, L. (Tsinghua University)  
 SO Nonferrous Metals (China) (Aug. 1996) 48, (3), 65-69, Graphs, 3 ref.  
 ISSN: 1001-0211  
 DT Journal  
 CY China  
 LA Chinese  
 AB The pure solution of  $\text{CoCl}_2$  can be prepared from the low grade cobalt ores  
 by roasting, leaching and purifying. In this paper, the process of  
 preparation of  $\text{Co}(\text{Ac})_2$  from  $\text{CoCl}_2$  by ion exchange was studied in detail. A  
 macroporous weakly acidic cation exchange resin was selected. We completed  
 the experiments in single column and multicolumns, chose the suitable  
 operation parameters of ion exchange, suggested a reasonable process and  
 performed the pilot experiment with practical solution. It is showed that  
 the  $\text{CoCl}_2$  solution can be converted into  $\text{Co}(\text{Ac})_2$  with ion exchange, at the  
 same time, anions, such as  $\text{Cl}^-$ ,  $\text{SO}_4^{2-}$ ,  $\text{NO}_3^-$  and so on, are removed  
 effectively. The recovery of Co is >99.5%, and the prepared  $\text{Co}(\text{Ac})_2$   
 solution meets requirements to prepare chemical pure cobalt acetate.

CC 43 Refining and Purification  
 CT Journal Article; Cobalt: Extraction; Ion exchanging  
 ET  $\text{Cl}^*\text{Co}$ ;  $\text{CoCl}_2$ ; Co cp; cp; Cl cp;  $\text{Ac}^*\text{Co}$ ; Ac sy 2; sy 2; Co sy 2;  $\text{Co}(\text{Ac})_2$ ; Ac  
 cp; Cl;  $\text{Cl}^-$ ; Cl in 1; in 1;  $\text{O}^*\text{S}$ ;  $\text{SO}_4$ ;  $\text{SO}_4^{2-}$ ; S cp; O cp;  $\text{SO}_4$  in 2; in 2;  
 $\text{N}^*\text{O}$ ;  $\text{NO}_3$ ;  $\text{NO}_3^-$ ; N cp;  $\text{NO}_3$  in 1; Co

L50 ANSWER 14 OF 42 METADEX COPYRIGHT 2002 CSA  
 AN 1997(9):43-259 METADEX  
 TI Purification of cobalt leaching solution by solvent extraction with N235.  
 AU He, P. (Tsinghua University); Zhu, D. (Tsinghua University); Fang, J.  
 (Tsinghua University); Bao, F. (Tsinghua University); Zhang, Z. (Tsinghua  
 University); Liu, Y. (Tsinghua University); Wang, L. (Tsinghua University)  
 SO Nonferrous Metals (China) (Aug. 1996) 48, (3), 61-64, 4 ref.  
 ISSN: 1001-0211  
 DT Journal  
 CY China  
 LA Chinese



AB Distribution ratios of some metals between 30%N235-20% iso-octanol-kerosene organic phase and the chloride solution obtained from roasting and leaching cobalt-sulfur ore, were measured. The extraction order was: Zn>Fe(III)>Cu>Co, Fe(II)>Mn>Ca>Mg. According to the distribution ratios, a process with two fractional extraction sections was designed to get pure cobalt chloride. In the process, 35 centrifugal contactors of 20 mm diameters was used to prepare CoCl<sub>2</sub> solution for producing 1.5 kg of Co(CH<sub>3</sub>COO)<sub>2</sub>. The results show that the all metal impurities in the CoAl<sub>2</sub> except Mn are satisfied for producing Co(CH<sub>2</sub>3COO)<sub>2</sub> with chemical purity. The Co loss in the raffinate is <1%. The direct recovery of Co is >94%. The process is feasible and reliable.

CC 43 Refining and Purification

CT Journal Article; Cobalt: Extraction; Purification; Pregnant liquors; Solvent extraction

ET Fe; Cl\*Co; CoCl<sub>2</sub>; Co cp; cp; Cl cp; Co; C\*O; COO; C cp; O cp; Al\*Co; Al sy 2; sy 2; Co sy 2; CoAl<sub>2</sub>; Al cp; Mn; C\*H\*Co\*O; Co(CH<sub>2</sub>3COO)<sub>2</sub>; H cp

L50 ANSWER 15 OF 42 WPIX (C) 2002 THOMSON DERWENT

AN 1995-066914 [09] WPIX

DNC C1995-029612

TI High purity **nickel chloride mfr.** for electroless **nickel** plating - using recycled waste nickel anodes to reduce environmental pollution.

DC E31 M13

IN AHN, S H; BAE, M H; LEE, J Y; SOHN, J G; AHN, S; BAE, M; LEE, J; SONN, J

PA (POHA-N) POHANG IRON & STEEL CO LTD; (REIN-N) RES INST IND SCI & TECHNOLOGY; (POSC-N) POSCO; (RIST-N) RIST

CYC 19

PI WO 9502073 A2 19950119 (199509)\* EN 19p C22B000-00  
 RW: AT BE CH DE DK ES FR GB GR IE IT LU MC NL PT SE  
 W: JP US

EP 663017 A1 19950719 (199533) EN C22B023-00 <--  
 R: FR

JP 07507036 W 19950803 (199539) 6p C01G053-09

WO 9502073 A3 19950309 (199612) C22B000-00

JP 2668287 B2 19971027 (199748) 7p C01G053-09

EP 663017 B1 19980930 (199843) EN C22B023-00 <--  
 R: FR

US 5853692 A 19981229 (199908) C01G053-09

KR 9605510 B1 19960425 (199916) C01G053-09

ADT WO 9502073 A2 WO 1994-KR82 19940701; EP 663017 A1 EP 1994-919899 19940701, WO 1994-KR82 19940701; JP 07507036 W WO 1994-KR82 19940701, JP 1995-503965 19940701; WO 9502073 A3 WO 1994-KR82 19940701; JP 2668287 B2 WO 1994-KR82 19940701, JP 1995-503965 19940701; EP 663017 B1 EP 1994-919899 19940701, WO 1994-KR82 19940701; US 5853692 A Cont of WO 1994-KR82 19940701, Cont of US 1995-392846 19950301, US 1997-899956 19970724; KR 9605510 B1 KR 1993-12393 19930702

FDT EP 663017 A1 Based on WO 9502073; JP 07507036 W Based on WO 9502073; JP 2668287 B2 Previous Publ. JP 07507036, Based on WO 9502073; EP 663017 B1 Based on WO 9502073

PRAI KR 1993-12393 19930702

REP FR 2263979; FR 2263980; GB 1598767; US 4221765

IC ICM **C22B023-00**

ICS C01G053-09

AB WO 9502073 A UPAB: 19950306  
 Mfr. of high purity **NiCl<sub>2</sub>** comprises: (a) pretreating waste Ni anode obtd. from an electroplating factory of a steel mfg. plant to remove impurities adhered on the surface; (b) working the pretreated waste Ni

anode to increase the specific surface area; (c) placing the processed waste Ni anode into aq. chloric acid soln. of 10-35% to give equiv. ratio of Ni, **HCl** and **NiCl<sub>2</sub>** 1; (d) dissolving the worked waste Ni anode at a reaction temp. of 20-80deg.C to form aq. **NiCl<sub>2</sub>** soln.; (e) filtering the aq. **NiCl<sub>2</sub>** soln. to remove insol. materials; (f) injecting an oxidising gas into an impurity treating tank at pH 2-5 to form Fe and Cr ions into a sludge, carrying out and filtering; and (g) adding 0.1-2.0g/l Ni powder into the aq. **NiCl<sub>2</sub>** soln. to remove heavy metal ions.

Also claimed is a method as above, but including an extra step: (h) **heat** concentrating the impurity treated **NiCl<sub>2</sub>** into a crystalline powder.

USE - Used to mfr. **NiCl<sub>2</sub>** for mfr. of a Zn-Ni coated steel plate, for electroless Ni plating industry for electronic components. Also used to mfr. a high purity chemical additive Ni powder.

ADVANTAGE - High purity **NiCl<sub>2</sub>** can be mfd. from waste Ni anodes without complicated impurity removal. Also environmental damage by Zn Cl is reduced.

Dwg.0/0

FS CPI  
FA AB; DCN  
MC CPI: E35-W; M13-B

L50 ANSWER 16 OF 42 WPIX (C) 2002 THOMSON DERWENT

AN 1996-170261 [17] WPIX

DNC C1996-053677

TI Cobalt and **cobalt chloride** prodn. from cobalt-ferrous concentrate - includes dissolving cobalt-ferrous concentrate in **hydrochloric acid** and **purifying cobalt chloride**.

DC E31 M25 M28

IN MAKOVSKAYA, G V; MOISA, L P; SPIVAKOVSKII, V S

PA (AUME-R) AS UKR METAL PHYS INST

CYC 1

PI RU 2041276 C1 19950809 (199617)\* 4p C22B023-00 <--

ADT RU 2041276 C1 SU 1988-4610668 19881130

PRAI SU 1988-4610668 19881130

IC ICM **C22B023-00**

AB RU 2041276 C UPAB: 19960428

Processing the cobalt-ferrous concentrate involves prepreg. it by repulping the cake in H<sub>2</sub>SO<sub>4</sub>, dissolving the concentrate while heating, removing the impurities from the concentrate and producing Co. The novelty of the process is that the concentrate is dissolved in **HCl**, cooled and the **CoCl<sub>2</sub>** so-obtd. is purified by employing multi-stage countercurrent crystallising purificn. to achieve a specified purity level, after initially filling the apparatus with crystalline **CoCl<sub>2</sub>** and its satd. solns. on a crystallisation purificn. line and with a **CoCl<sub>2</sub>** soln. on a Co electro-extn. line. Under these conditions, the spent Co electro-extn. electrolyte is fully satd. with purified **CoCl<sub>2</sub>**, and part of this soln. (in an amt. equal to the recycled crystallisation mother liquors usage) is supplied to the final **CoCl<sub>2</sub>** recrystallisation stage. The remainder of the soln. is recycled to the Co electro-extn. stage, and the mother liquor (from the first crystallisation stage), or that part of it that contains (10-33 % of the total concentrate Co content, is used for the acidic repulping of the cobalt-ferrous cake after the Fe and Mn (in the form of hydroxides) has been initially sepd. from the mother liquor by treating it with a portion

of the said cobalt-ferrous cake at 70-80 deg.C and pH 0.8-1.2.

USE - In the prodn. of metallic Co and **CoCl<sub>2</sub>**.

ADVANTAGE - Avoids the generation of industrial effluent, and reduces the consumption of reagents.

Dwg.0/0

FS CPI

FA AB; DCN

MC CPI: E35-V; M25-B02; M25-G11

L50 ANSWER 17 OF 42 WPIX (C) 2002 THOMSON DERWENT

AN 1992-365412 [44] WPIX

DNN N1992-278560 DNC C1992-162185

TI **Cobalt** metal powder mfr. - by **purifying** hexamine **cobalt chloride** soln. then decomposing to oxide material and reducing.

DC A91 E31 M22 P53

IN CHERESNOWSKY, M J; KIM, T K; MILLER, M J; WOLFE, T A

PA (SYLV) GTE PROD CORP

CYC 1

PI US 5154757 A 19921013 (199244)\* 4p B22F009-00

ADT US 5154757 A US 1991-783752 19911028

PRAI US 1991-783752 19911028

IC ICM B22F009-00

ICS **C22B023-00**

AB US 5154757 A UPAB: 19931116

Co contg. solids contg. Ca++, Cd++ and/or Mg++ as impurities are converted to a hexamine cobalt (III) chloride soln. and fed through a cation **exchange resin** to remove impurities.. Purified soln. is then pH adjusted to 12.5-13 to decompose the hexamine cobalt (III) soln. to an insol. cobalt oxide contg. material for sepn. from the soln. and redn. to pure cobalt metal powder prod..

USE/ADVANTAGE - Impure Co contg. solids are scrap WC mine or cutting tool bits, scrap Co metal or scrap cathodes, Prod. is used in mfr. of cemented carbide cutting tool

Dwg.0/0

FS CPI GMPI

FA AB; DCN

MC CPI: A12-M03; E11-Q02; E32-A04; E34-B; E34-D; E35-D; M22-H01

L50 ANSWER 18 OF 42 WPIX (C) 2002 THOMSON DERWENT

AN 1989-227317 [31] WPIX

DNC C1989-100979

TI **Cobalt purificn.** - by precipitating **cobalt** hydroxide from hex ammine **cobalt chloride** soln., washing and firing.

DC E31 J01 M25

IN CHRISTINI, J N; HUSTED, E F; LADD, J A; MILLER, M J; SCHWARTZ, A R

PA (SYLV) GTE PROD CORP

CYC 1

PI US 4840776 A 19890620 (198931)\* 3p

ADT US 4840776 A US 1987-107078 19871013

PRAI US 1987-107078 19871013

IC C01G051-00; **C22B023-00**

AB US 4840776 A UPAB: 19950117

(i) NaOH is added to hexamine cobalt (III) chloride soln. at 80 deg.C at least to ppte. cobaltic hydroxide. Rate of addn. is below 0.22 moles NaOH/mole Co/min and amt. added is below 1.4 times the stoichiometric amt. needed to ppte. the hydroxide. (ii) after solid/liq. sepn. the hydroxide

is washed with hot deionised H<sub>2</sub>O to remove Na to a level below 60ppm, and (iii) fired at 180-850 deg.C to remove H<sub>2</sub>O and NH<sub>3</sub> to below a 200ppm. level.

USE/ADVANTAGE - Chloride soln. in (i) can be obtd. from digestion of Co scrap in HCl followed by addn. of NH<sub>3</sub>. Prod. is reducible to pure metal powder for use in cemented carbide mfr.

0/0

Dwg..0/0

FS

CPI

FA

AB; DCN

MC

CPI: E35-V; J01-B; M25-B01; M25-G11

L50 ANSWER 19 OF 42 HCAPLUS COPYRIGHT 2002 ACS

AN 1989:427270 HCAPLUS

DN 111:27270

TI Manufacture of metal composites

IN Nishimura, Takanobu; Ishiwatari, Yutaka

PA Toshiba Corp., Japan

SO Jpn. Kokai Tokkyo Koho, 8 pp.

CODEN: JKXXAF

DT Patent

LA Japanese

IC ICM C22F001-00

CC 56-4 (Nonferrous **Metals** and Alloys)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	JP 63290251	A2	19881128	JP 1987-124046	19870522
AB	The composites esp. for robot and automobile parts are manufd. by forming a SiC fiber or whisker preform and infiltrating a molten Al alloy into the preform. The SiC fibers or whiskers are prepd. by rinsing with a HF soln. to adjust SiO <sub>2</sub> content (<1%) of the fibers and by coating with Ni, Cu, Co, Ag, Au, P, Cr, or their alloys. Thus, SiC whiskers contg. 4.5% SiO <sub>2</sub> were mixed for 30 min with an aq. soln. contg. 10% HF, the mixt. was filtered, water rinsed, and dried. The obtained SiC whiskers contg. 0.3% SiO <sub>2</sub> were immersed for 10 min into an aq. soln. contg. 10 g SnCl <sub>4</sub> and 40 cm <sup>3</sup> HCl, and then a Ni coating soln. contg. NiCl <sub>2</sub> 5, N <sub>2</sub> H <sub>4</sub> .HCl 3, and Na tartrate 4.6 g/L to form a 0.1-.mu.m Ni coating layer. The preform from the prepd. SiC whiskers (12 vol.%) was infiltrated with AA 6061 Al alloy and the obtained reinforced composite was <b>heat</b> treated. The resp. tensile strength, yield strength, Vickers hardness, and Young's modulus for the obtained composite were 36.0, 25.0 kg/mm <sup>2</sup> , 160, and 9 .times. 103 kg/mm <sup>2</sup> vs. 20.0, 10.5 kg/mm <sup>2</sup> , 60, and 7.5 .times. 103 kg/mm <sup>2</sup> for an Al alloy composite prepd. similarly by using nontreated SiC whiskers.				
ST	silicon carbide aluminum alloy composite; whisker silicon carbide composite; silica removal silicon carbide composite; nickel coating silicon carbide composite				
IT	409-21-2P, Silicon carbide (SiC), uses and miscellaneous RL: PEP (Physical, engineering or chemical process); <b>PREP</b> ( <b>Preparation</b> ); PROC (Process) (composites of <b>nickel</b> -coated whiskers of, with aluminum alloy, manuf. of)				
IT	7440-02-0P, <b>Nickel</b> , uses and miscellaneous RL: PEP (Physical, engineering or chemical process); <b>PREP</b> ( <b>Preparation</b> ); PROC (Process) (composites of silicon carbide whiskers coated with, with aluminum alloy, manuf. of)				

- IT 12616-75-0P, AA6061  
RL: PEP (Physical, engineering or chemical process); **PREP**  
(**Preparation**); PROC (Process)  
(composites with **nickel**-coated silicon carbide whiskers,  
manuf. of)
- IT 7631-86-9, Silica, uses and miscellaneous  
RL: PEP (Physical, engineering or chemical process); PROC (Process)  
(removal of, from silicon carbide whiskers, in manuf. of aluminum alloy  
composites)
- L50 ANSWER 20 OF 42 HCAPLUS COPYRIGHT 2002 ACS  
AN 1987:35474 HCAPLUS  
DN 106:35474  
TI Preparation of **cobalt chloride** from cobalt-containing  
sludge from nickel electrowinning  
AU Wei, Yihai; Yang, Zhi Kuan; He, Dongbao; Wang, Dingjiang; Wu, Xusen  
CS Xinyang Army Mil. Coll., Peop. Rep. China  
SO Huaxue Shijie (1986), 27(11), 510-13  
CODEN: HUAKAB; ISSN: 0367-6358  
DT Journal  
LA Chinese  
CC 49-5 (Industrial Inorganic Chemicals)  
Section cross-reference(s): **54**
- AB Co sludge from Ni electrowinning was dissolved in H<sub>2</sub>SO<sub>4</sub>, mixed with NaClO<sub>3</sub>  
at 70.degree. for removal of Fe, filtered, extd. with fatty acids for  
removal of **Cu**, mixed with Na<sub>2</sub>CO<sub>3</sub> for pptn. of Co and Ni,  
filtered, and the cake was dissolved in **HCl**, extd. with a  
tertiary amine for sepn. of Co, extd. with aq. **HCl**, and crystd.  
to obtain **CoCl<sub>2</sub>**. The Co recovery was .gtoreq.97% and the  
**CoCl<sub>2</sub>.6H<sub>2</sub>O** was 99.06% pure.
- ST **cobalt chloride** manuf slag; nickel electrowinning slag  
**cobalt chloride**
- IT Slimes and Sludges  
(nickel electrowinning, **cobalt chloride** manuf.  
from)
- IT **7646-79-9P, Cobalt chloride**, preparation  
RL: **IMF** (**Industrial manufacture**); **PREP** (**Preparation**)  
(manuf. of, from nickel electrowinning sludge)
- L50 ANSWER 21 OF 42 WPIX (C) 2002 THOMSON DERWENT  
AN 1985-267359 [43] WPIX  
DNC C1985-115912  
TI **Mfg.** mixed soln. of **nickel** and **cobalt**  
**chloride(s)** - involves heating oxide(s) and/or hydroxide(s),  
washing out sulphate, impurities and dissolving in **hydrochloric**  
**acid**.
- DC E31  
PA (SUMM) SUMITOMO METAL MINING CO  
CYC 1  
PI JP 60180921 A 19850914 (198543)\* 3p  
ADT JP 60180921 A JP 1984-33712 19840224  
PRAI JP 1984-33712 19840224  
IC C01G051-08; C01G053-09; **C22B023-04**  
AB JP 60180921 A UPAB: 19930925  
Oxides and/or hydroxides of trivalent Ni and Co contg. SO<sub>4</sub> ions are heated  
at temp. of 750-900 deg.C. The fired prod. is washed and dissolved in  
**HCl**.  
Heating is done pref. at temp. of 800-850 deg.C for over 30 minutes.

By heating SO<sub>4</sub> in the fired prod. is transferred to water in washing step, and removed from the residue. Small amounts of Ni and Co in washing water are recovered by pptn. or using **ion-exchange resins**.

**ADVANTAGE** - When by-prods., e.g. ppte. obtd. from Ni electrolyte, treated by the method, is dissolved in **HCl**, Cl<sub>2</sub> gas does not generate and mixed solution of **NiCl<sub>2</sub>** and **CoCl<sub>2</sub>** formed contains little SO<sub>4</sub>. In an example, to remove Co in Ni electrolyte, the electrolyte was oxidised with Cl<sub>2</sub> gas and neutralised with Ni<sub>2</sub>CO<sub>3</sub>. Ppte formed contained 34.4 wt.% Ni, 15.3 wt.% Co, 6.7 wt.% SO<sub>4</sub><sup>2-</sup>. 60g of the precipitate were heated at 800 deg.C for 60 minutes. 20g of the fired prod. and 200 ml of water in 500 ml beaker were stirred at 55 deg.C for 30 minutes. 10g of the residue obtained by filtration and 36.5 ml 25 wt.% **HCl** were stirred in 200 ml beaker to dissolve the residue in **HCl**. Amts. of Cl<sub>2</sub> gas generated was 0.013 g and SO<sub>4</sub> amts. in mixed soln. was 0.058 g.

O/O

FS CPI

FA AB

MC CPI: E35-V; E35-W

L50 ANSWER 22 OF 42 METADEX COPYRIGHT 2002 CSA

AN 1985(10):43-206 METADEX

TI Extra-Clean Metals. Advanced Purification of Nickel and Iron.

AU Dinu, M.

SO Metalurgia (Bucharest) (Nov. 1983) 35, (11), 599-603

ISSN: 0461-9579

DT Journal

LA Romanian

AB A brief review on obtaining high purity metals by ion-exchange chromatography is given. Positive results have been obtained especially using neutral NiCl<sub>2</sub> solutions for high purity Ni with very low contaminations of Fe (2.1 ppm)Co, (n.d.)Cu, (0.1 ppm). Comparative data on composition of the obtained metal are given, using different purification methods. Good results may be achieved using the same method for Fe purification. 10 ref.-R.Z.

CC 43 REFINING AND PURIFICATION

CT Nickel: Refining; Iron: Refining; Purification; Ion exchanging; Chromatography

ET Cl\*Ni; NiCl<sub>2</sub>; Ni cp; cp; Cl cp; Ni; Fe; Co; Cu

L50 ANSWER 23 OF 42 HCAPLUS COPYRIGHT 2002 ACS

AN 1984:55093 HCAPLUS

DN 100:55093

TI Recovery of cobalt from mixtures with other elements

IN Oproiu, Letitia; Totoiu, Ana

PA Intreprinderea de Utilaj Chimic, Rom.

SO Rom., 2 pp.

CODEN: RUXXA3

DT Patent

LA Romanian

IC C01G051-04

CC 54-2 (Extractive Metallurgy)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	RO 80190	B	19821206	RO 1980-100242	19800220
AB	To achieve high purity and quant. sepn. of Co from mixts. with Fe, Cr, Ni,				

Cu, Ti, Al, W, the heterogeneous mixt. in the form of powder or shavings is dissolved in **HCl**. The insol. elements are sepd. by filtration and the soln. heated to 105.degree. to evap. the excess **HCl**. The soln. of chlorides is treated with  $\text{NH}_3$  and  $\text{NH}_4\text{Cl}$  to pH 5-5.5 to ppt. all impurities. The filtered ppt. is redissolved, repptd., and filtered. The solns. contg. **CoCl<sub>2</sub>** are heated to 50.degree. and treated with oxalic acid under const. stirring at pH 3.5-4. The pptd. Co oxalate is filtered, dried, and calcined at 800-1000.degree. to  $\text{CoO}$ , which is reduced to metal powder at 450-500.degree. in an atm. of H and N. The yield of Co is 96-7%.

ST cobalt recovery metal mixt; **hydrochloric acid** leaching cobalt

IT 7440-48-4P, preparation

RL: **PUR (Purification or recovery); PREP (Preparation)**  
(recovery of, from metal mixt. by leaching with **hydrochloric acid**)

L50 ANSWER 24 OF 42 WPIX (C) 2002 THOMSON DERWENT

AN 1982-44184E [22] WPIX

TI Forming cobaltous chloride from cobaltic cpd. - by dissolving cpd. in **hydrochloric acid** contg. organic reducing agent.

DC E31 M25

IN DEVUYST, E A; ETTEL, V A; ILLIS, A

PA (INTN) INCO LTD

CYC 6

PI EP 52444 A 19820526 (198222)\* EN 11p

R: BE FR GB

ZA 8107436 A 19820820 (198243)

US 4394366 A 19830719 (198331)

CA 1158018 A 19831206 (198402)

PRAI CA 1980-364745 19801114

REP DE 1079019; US 4151258

IC C01G051-08; C01G053-08; **C22B023-04**

AB EP 52444 A UPAB: 19930915

**CoCl<sub>2</sub>** is **prep.** from a trivalent Co cpd. by

(a) forming an aq. slurry of the Co (III) cpd; and (b) treating with **HCl** in the presence of an organic reductant capable of reducing Co (III) to Co (II), with **HCl** added at a rate maintaining slurry pH not less than 1, so Co (III) is reduced and dissolved as Co (II).

The reductant is pref. a 1-4C alcohol or alcohol oxidn. prod., esp. methanol, formaldehyde or formic acid, pref. used in excess for reducing all Co (III) or Co (II). It may be added in admixt. with **HCl**. Reaction is pref. at over 75 deg.C. The resulting soln. is pref. evapd. to yield crystallised **CoCl<sub>2</sub>**.

The **CoCl<sub>2</sub>** formed is also claimed. Forms **CoCl<sub>2</sub>** for Co recovery from e.g.  $\text{Co}(\text{OH})_3$  byprod. from **purificn.** of Ni electrolytes in Ni electrorefining or electrowinning plants or **purificn.** of Ni leach solns., without  $\text{Cl}_2$  generation.

FS CPI

FA AB

MC CPI: E35-V; M25-B; M25-E; M25-G11

L50 ANSWER 25 OF 42 HCAPLUS COPYRIGHT 2002 ACS

AN 1982:566786 HCAPLUS

DN 97:166786

TI Purification of **cobalt chloride** solutions. The winning of very pure metal and its characterization

AU Bourahla, M.; Bouquet, G.; Dubois, B.

CS SONAREM, Algeria  
 SO Proc. - Int. Conf. Cobalt: Metall. Uses (1981), Volume 1, 107-23  
 Publisher: Benelux Metall., Brussels, Belg.  
 CODEN: 47XNAJ  
 DT Conference  
 LA English  
 CC 54-3 (Extractive Metallurgy)  
 AB Co was purified by soln. in **HCl**, removal of Fe to 5 .times.  
 10-4% by **extn.** with MIBK, removal of Ni to 8 .times. 10-4% by  
**ion exchange** on Dowex 1 .times. 8 resin, and  
 electrolysis. Electrolysis gave Co of >99.998% purity (anal. for 31  
 elements is given). Ultimate purifn. by zone melting gave Ni and Fe  
 values of <0.4 .times. 10-4 and 1 .times. 10-4%, resp. Microstructure,  
 internal friction, elec. resistance, and recrystn. of pure Co are  
 discussed.  
 ST cobalt purifn property; iron removal cobalt purifn; nickel removal cobalt  
 purifn; solvent **extn** cobalt purifn; **ion**  
**exchange** cobalt purifn; electrolysis cobalt purifn  
 IT **7440-48-4P**, preparation  
 RL: **PUR (Purification or recovery); PREP (Preparation)**  
 (purifn. of)  
 IT 7439-89-6, uses and miscellaneous 7440-02-0, uses and miscellaneous  
 RL: **REM (Removal or disposal); PROC (Process)**  
 (removal of, from cobalt)

L50 ANSWER 26 OF 42 WPIX (C) 2002 THOMSON DERWENT  
 AN 1980-45144C [26] WPIX  
 TI **Purificn.** of aq. acid **nickel chloride** solns.  
 - contg. cobalt, **copper**, iron or zinc, by selective extn. with  
 an organic solvent soln. of tri butyl phosphate.  
 DC E31 M25  
 IN LEAVER, H S; MEYER, G A; PETERS, M A  
 PA (AMMX) AMAX INC  
 CYC 9  
 PI BE 881559 A 19800530 (198026)\*  
 DE 3005447 A 19800828 (198036)  
 NL 8000100 A 19800819 (198036)  
 GB 2041345 A 19800910 (198037)  
 US 4221765 A 19800909 (198039)  
 JP 55113845 A 19800902 (198042)  
 JP 55113846 A 19800902 (198042)  
 BR 8000840 A 19801029 (198046)  
 FR 2449064 A 19801017 (198048)  
 CA 1138650 A 19830104 (198306)  
 GB 2041345 B 19830309 (198310)  
 PRAI US 1979-12782 19790216  
 IC B01D011-04; C01G053-09; **C22B023-04**  
 AB BE 881559 A UPAB: 19930902  
 Aq. acid Ni chloride solns. contg. 50-320 g./l. Ni, opt. >=1 g./l. Co, and  
 >=1 impurity chosen from **Cu**, Fe and Zn, with a conc. of free  
**HCl** of 0.2-4 N and a total chloride conc. of 4-11 N, are purified  
 by extn. with a solvent. The extn. agent used is a mixt. of 5-70vol. %  
 tributylphosphate in a water-immiscible organic solvent, the ratio organic  
 soln./aq.soln. being chosen such that a major amt. of the impurity is  
 extd. from the aq. soln. The organic and aq. solns. are then sepd. to  
 give an aq. Ni chloride soln. impoverished w.r.t. the impurity, and an  
 organic soln. charged with the impurity.  
 Process gives good **purificn.** of crude **Ni** chloride



solns. contg. impurities such as Co, Cu, Fe or Zn, to give solns suitable for recovery of marketable Ni. The process is esp. useful for extn. of Ni chloride solns. obtd. by HCl leaching of nickeliferous sulphide materials as described in BE 881560.

FS CPI  
FA AB  
MC CPI: E05-G09C; E35-W; M25-B; M25-G19

L50 ANSWER 27 OF 42 WPIX (C) 2002 THOMSON DERWENT

AN 1979-18470B [10] WPIX

TI Extraction of impurities from a molten nickel matte - involves chlorinating the matte under a molten salt layer.

DC M25

PA (INTN) INCO LTD

CYC 3

PI FR 2393072 A 19790202 (197910)\*

GB 1563589 A 19800326 (198013)

CA 1095730 A 19810217 (198111)

PRAI GB 1977-22872 19770531

IC C22B023-04

AB FR 2393072 A UPAB: 19930901

The matte contg. Fe, Cu, Co, Pb, Cr, Zn, Mn, Cd as impurities, is purified by chlorinating the molten matte so that the impurities are chlorinated. The treatment is effected under a molten salt layer comprising  $\geq 1$  alkaline metal chloride which dissolves the chloride(s) formed, the impurity-contg. salt then being sepd. from the molten matte and being converted to solid fragments. The fragments are leached with a satd. aqs 2 contg. the alkaline metal chloride(s) present, with a pH  $< 5$ , to dissolve the metallic chloride(s). The impurity-contg. aq. soln is then sepd. to produce the purified salt. The leaching process lasts no longer than 10 mins and the aq. leaching soln also contains dissolved **nickel chloride** at  $\geq 50$  g/l but not sufficient to saturate the leach soln.

The salt is **purified** without the **nickel chloride** being transferred to the leach soln. so that a nickel recuperation is no necessary.

FS CPI  
FA AB  
MC CPI: M25-B; M25-G19

L50 ANSWER 28 OF 42 HCAPLUS COPYRIGHT 2002 ACS

AN 1977:409196 HCAPLUS

DN 87:9196

TI Recovery of useful metals from nodules deposited in the ocean bed

PA Deepsea Ventures, Inc., USA

SO Japan., 13 pp.

CODEN: JAXXAD

DT Patent

LA Japanese

IC C22B003-00

CC 54-2 (Extractive **Metallurgy**)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	JP 51044881	B4	19761201	JP 1971-36171	19710526
	JP 55004817	B4	19800201	JP 1976-64031	19760601
PRAI	JP 1971-36171		19710526		

AB Metal-contg. nodules deposited on the ocean bed are treated with

HCl to form aq. solns. of metal chloride(s) (e.g., chlorides of Mn, Ni, and Co) and leached with an org. solvent contg. a liq. ion-exchanging agent. The resulting metal chloride-contg. solns. are treated with H<sub>2</sub>SO<sub>4</sub> for removal of the liq. ion-exchanging agent and electrolyzed to recover the metals. Thus, nodules contg. Mn 27.7, Ni 1.30, Cu 1.06, Co 0.26, and Fe 6.03% were crushed to -35 mesh, reacted with HCl at 500.degree. for 2 h, leached with water to give a soln. contg. MnCl<sub>2</sub> 200 (as Mn), NiCl<sub>2</sub> 9.46 (as Ni), CuCl<sub>2</sub> 7.68 (as Cu), and CoCl<sub>2</sub> 1.83 (as Co) g/L, filtered, and extd. with an org. solvent contg. Kelex 100 to sep. the CuCl<sub>2</sub> in the soln. The CuCl<sub>2</sub> contg. soln. was then treated with H<sub>2</sub>SO<sub>4</sub> and electrolyzed to recover Cu. Similarly, the remaining MnCl<sub>2</sub>-, NiCl<sub>2</sub>-, CoCl<sub>2</sub>-, and FeCl<sub>2</sub>-contg. soln. was extd. with a suitable org. solvent to recover Mn, Ni, and Co.

ST copper recovery manganese nodule; nickel recovery manganese nodule; cobalt recovery manganese nodule

IT Nodules

RL: PROC (Process)

(manganese, leaching and extn. of, for metal recovery)

IT 7439-89-6P, preparation 7440-02-0P, preparation

7440-48-4P, preparation 7440-50-8P, preparation

RL: PUR (Purification or recovery); PREP (Preparation)

(recovery of, from manganese nodules by leaching and extn.)

IT 7439-96-5P, preparation

RL: PUR (Purification or recovery); PREP (Preparation)

(recovery of, from nodules by leaching and extn.)

L50 ANSWER 29 OF 42 HCAPLUS COPYRIGHT 2002 ACS

AN 1977:45882 HCAPLUS

DN 86:45882

TI Hydrometallurgical process for the treatment of nickel matte

IN Demarthe, Jean M.; Gandon, Louis; Goujet, Monique

PA Societe Metallurgique le Nickel, Fr.

SO Ger. Offen., 70 pp.

CODEN: GWXXBX

DT Patent

LA German

IC C22B023-04

CC 54-2 (Extractive Metallurgy)

FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 2601534	A1	19761202	DE 1976-2601534	19760116
	DE 2601534	B2	19770317		
	DE 2601534	C3	19771027		
	FR 2297925	A1	19760813	FR 1975-1264	19750116
	FR 2334756	A2	19770708	FR 1975-38166	19751212
	BE 837406	A1	19760708	BE 1976-163385	19760108
	SE 7600283	A	19760719	SE 1976-283	19760113
	SE 458204	B	19890306		
	SE 458204	C	19890629		
	AU 7610232	A1	19770721	AU 1976-10232	19760113
	AU 499399	B2	19790412		
	FI 7600071	A	19760717	FI 1976-71	19760114
	FI 65813	B	19840330		
	FI 65813	C	19840714		
	ZA 7600204	A	19761229	ZA 1976-204	19760114

NO 7600138	A	19760719	NO 1976-138	19760115
NO 146993	B	19821004		
NO 146993	C	19830112		
BR 7600227	A	19760831	BR 1976-227	19760115
GB 1484121	A	19770824	GB 1976-1657	19760115
NL 7600461	A	19760720	NL 1976-461	19760116
NL 188296	B	19911216		
NL 188296	C	19920518		
JP 51098622	A2	19760831	JP 1976-4563	19760116
JP 60018733	B4	19850511		
ES 444363	A1	19771001	ES 1976-444363	19760116
US 4173520	A	19791106	US 1977-849603	19771108
US 4236981	A	19801202	US 1979-54888	19790705
SE 8008714	A	19801211	SE 1980-8714	19801211
SE 446747	B	19861006		
SE 446747	C	19870122		
PRAI FR 1975-1264		19750116		
FR 1975-38166		19751212		
US 1976-649744		19760116		
US 1977-849603		19771108		
AB	High-purity Ni and Co are recovered from Ni matte contg. Ni .apprx.75, Co 1.5-2, and Fe 2-4%. The matte is ground and leached in a FeCl <sub>3</sub> soln. by passing through Cl <sub>2</sub> which oxidizes Fe(II) to Fe(III). FeCl <sub>3</sub> is partially extd., and Ni is sepd. from Co and the residual Fe by <b>ion exchange</b> . Ni is obtained from the purified NiCl <sub>2</sub> soln. by electrolysis. Thus, a Ni matte contg. Ni 77.5, Co 1.62, Fe 1.9, and S 17.8% was ground to 125.mu. and suspended in an FeCl <sub>3</sub> soln. The suspension was leached at 95.degree. for 6 h in a reactor with blowing of Cl <sub>2</sub> gas to maintain a const. redox potential of 700 mV. The Fe(III) was partially extd. by a (BuO) <sub>3</sub> PO (TBP) soln. with aq.-to-org. phase ratio of 1.5. After partial <b>extn.</b> of FeCl <sub>3</sub> , the soln. was passed through an <b>ion-exchange</b> resin IRA 400 C to obtain a purified NiCl <sub>2</sub> soln. and a soln. of FeCl <sub>3</sub> and <b>CoCl<sub>2</sub></b> . The NiCl <sub>2</sub> soln. was subjected to electrolysis to obtain Ni and Cl. The FeCl <sub>3</sub> from the TBP soln. was reextd. in 0.1N HCl and returned for leaching the Ni matte. The recovery of Ni from the matte into the soln. after leaching was 96%.			
ST	nickel cobalt recovery matte; chlorine leaching nickel matte; iron chloride leaching nickel			
IT	7705-08-0, uses and miscellaneous RL: RCT (Reactant) (leaching by, of matte contg. cobalt and nickel)			
IT	7440-02-0P, preparation <b>7440-48-4P</b> , preparation RL: <b>PUR (Purification or recovery); PREP (Preparation)</b> (recovery of, from matte, by leaching with iron chloride)			
L50	ANSWER 30 OF 42 HCAPLUS COPYRIGHT 2002 ACS			
AN	1976:124830 HCAPLUS			
DN	84:124830			
TI	Purification of <b>nickel chloride</b> solutions			
IN	Sabot, Jean L. F.; Rosset, Robert H.			
PA	Le Nickel, Fr.			
SO	Fr. Demande, 10 pp. CODEN: FRXXBL			
DT	Patent			
LA	French			
IC	C01G			
CC	54-2 (Extractive <b>Metallurgy</b> )			

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	FR 2263980	A1	19751010	FR 1974-8279	19740312
	FR 2263980	B1	19761217		
AB	<p><b>NiCl<sub>2</sub></b> derived from Ni ores by leaching with <b>HCl</b> contains Fe(II), Fe(II), Co (II), <b>Cu(II)</b>, etc. impurities which yield impure Ni. A synthetic <b>NiCl<sub>2</sub></b> soln. was prepd. consisting of <b>NiCl<sub>2</sub></b> 0.25, FeCl<sub>2</sub> 0.25, and CaCl<sub>2</sub> 5 mole/l., to simulate <b>NiCl<sub>2</sub></b> in industrial practice. The soln. was heated at 75.degree. to reduce soln. viscosity and kept under N or inert gas atm. to prevent oxidn. of Fe(II). The soln. was passed through an <b>ion-exchange</b> resin column contg. Dowex 2X10 [56690-56-3], anionic quaternary NH<sub>4</sub>-type, 100-200 mesh (20 cm .times. 1 cm<sup>2</sup>) at 13 ml/hr. The eluate was almost pure <b>NiCl<sub>2</sub></b>. The Fe(II) was eluted from the resin with 0.1N <b>HCl</b> or pure water.</p>				
ST	<b>nickel chloride</b> purifn <b>ion exchange</b>				
	; iron removal <b>nickel chloride</b>				
IT	<b>7440-02-0P</b> , preparation				
	RL: <b>PREP (Preparation)</b>				
	(from chloride solns., purifn. by <b>ion exchange</b> for)				
IT	56690-56-3				
	RL: PROC (Process)				
	(in iron removal from <b>nickel chloride</b> solns.)				
IT	<b>7718-54-9P</b>				
	RL: PUR (Purification or recovery); PREP (Preparation)				
	(purifn. of, by <b>ion exchange</b> )				
IT	7439-89-6, uses and miscellaneous				
	RL: REM (Removal or disposal); PROC (Process)				
	(removal of, from <b>nickel chloride</b> solns. by <b>ion exchange</b> )				

L50 ANSWER 31 OF 42 HCAPLUS COPYRIGHT 2002 ACS

AN 1974:415574 HCAPLUS

DN 81:15574

TI Reduction of metal chlorides with hydrogen

IN Gravenor, Conrad Percival; Rigg, Tyson

PA Research Council of Alberta

SO Ger., 8 pp.

CODEN: GWXXAW

DT Patent

LA German

IC C21B; C22B

CC 54-2 (Extractive **Metallurgy**)

FAN.CNT 2

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	DE 1433356	A1	19730215	DE 1964-R39072	19641022
	DE 1433356	B2	19731220		
	DE 1433356	C3	19740718		
	SE 325137	B	19700622	SE 1964-12657	19641021
PRAI	GB 1963-42028	A	19631024		
AB	<p>The extn. of metallic Fe, Ni, and Co by reducing their chloride salts with hot H is described. The process consists essentially of 3 steps: (1) scrap Fe of approx. compn. C 0.08-0.13, Ni+Cu 0.01-0.05, Mn 0.6-1, S 0.08-0.33 %, and the balance Fe and Fe<sub>2</sub>O<sub>3</sub>, was converted to FeCl<sub>2</sub> by reacting with aq. <b>HCl</b> at 90.degree., (2) crystn. of FeCl<sub>2</sub>.cntdot.4H<sub>2</sub>O from the soln. and drying the crystals with partial</p>				

oxidn. to give a compn. of FeCl<sub>2</sub> 72.5-82, Fe<sub>2</sub>O<sub>3</sub> 3-7, impurities 0.1-0.5, and H<sub>2</sub>O 15-20%, and (3) the pellets (1800g) were fed to a heated converter and reduced with a mixt. of H, H<sub>2</sub>O, N, and CH<sub>4</sub> at 0.21 kg/cm<sup>2</sup> and 780.degree. until the completion of reaction.

ST iron chloride redn hydrogen; nickel chloride redn hydrogen; **cobalt chloride** redn hydrogen; metal chloride redn hydrogen

IT 7439-89-6P, preparation 7440-02-0P, preparation **7440-48-4P**, preparation

RL: **PREP (Preparation)**

(from chloride, by hydrogen redn.)

L50 ANSWER 32 OF 42 HCAPLUS COPYRIGHT 2002 ACS

AN 1973:19142 HCAPLUS

DN 78:19142

TI Solvent extraction in nickel metallurgy. Falconbridge Matte Leach process

AU Wigstoel, Eivind; Froeyland, Kjell

CS Falconbridge Nikkelverk A/S, Kristiansand, Norway .

SO Ingenieursblad (1972), 41(17), 476-86

CODEN: INBLAF

DT Journal

LA English

CC 54-2 (Extractive **Metallurgy**)

AB Ni is sepd. from Cu- and Pt-contg. matte by HCl

leaching. The soln. is purified and NiCl<sub>2</sub>.4H<sub>2</sub>O is crystd. The metallic Ni is produced by one of the 3 processes from the crystals: electrolysis, direct redn., or **high-temp.** hydrolysis to oxide followed by H redn. The whole plant is computer controlled.

ST nickel manuf matte leaching

IT **7440-02-0P**, preparation

RL: **PREP (Preparation)**

(from **copper-** and platinum-contg. matte, by acid leaching and redn.)

L50 ANSWER 33 OF 42 HCAPLUS COPYRIGHT 2002 ACS

AN 1970:114138 HCAPLUS

DN 72:114138

TI **Separating** nickel as chloride crystals from solutions of cobalt salts

IN Kubo, Teruichiro; Taniguchi, Masao

PA Miyazaki, Kiyoshi

SO S. African, 12 pp.

CODEN: SFXXAB

DT Patent

LA English

CC 54 (Extractive **Metallurgy**)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
	-----	----	-----	-----	-----
PI	ZA 6902523		19691017		
PRAI	JP		19680904		

AB A more complete sepn. of Ni and Co than that provided by the difference in decompn. temp. of the carbonyls, or the selective oxidn. of Co from a chloride soln. of both metals, is obtained by blowing HCl gas into a soln. contg. both chlorides to sat. the soln. so that the soly. of NiCl<sub>2</sub> is decreased and crystals of hydrated NiCl<sub>2</sub> are pptd., leaving **CoCl<sub>2</sub>** unaffected in the soln. This pptn. and sepn. are also effective in sulfate solns., although the efficiency is better with low sulfate concn. The hydrated crystals are much more easily filtered out

than hydroxides. Fe and Cr can be sepd. from Ni and Co in soln. by known **ion-exchange** methods or pH adjustment. The details of several sepn. by this method are presented. After **HCl** gas was blown for 190 min into 3 l. of soln. contg. Ni 25.12, Co 25.4, and Fe 51.6 g/l., 280 g hydrated **NiCl<sub>2</sub>** crystals were filtered out, contg. 28.95% Ni and 0.01% each of Fe and Co, and the filtrate contained Fe 36.85, Co 18.14, and Ni 0.17 g/l. This soln. was heated to remove excess **HCl** down to 20%, and 80 g Fe lat he chips was added, to give a soln. contg. ferrous Fe 78.21, Co 24.5, and Ni 0.23%. **HCl** gas was blown as previously into this soln. to ppt. 672 g hydrated **FeCl<sub>2</sub>** crystals contg. 34.17% Fe and 0.01% Co, and when this was filter ed out the filtrate contained Co 17.45, Ni 0.16, and Fe 1.2 g/l. This small amt. of Fe was easily removed by an **ion-exchange** resin, leaving Co of acceptable com. purity.

ST nickel Co sepn; cobalt Ni sepn; chlorides Co Ni sepn

IT 7440-02-0P, preparation

RL: **PREP (Preparation)**

(sepn. of, from **cobalt** in solns. by chlorination)

IT 7440-48-4P, preparation

RL: **PREP (Preparation)**

(sepn. of, from nickel in solns. by chlorination)

L50 ANSWER 34 OF 42 HCAPLUS COPYRIGHT 2002 ACS

AN 1969:441708 HCAPLUS

DN 71:41708

TI Preparation of high-purity nickel and cobalt

IN Brooks, Parkman T.

PA United States Dept. of the Interior

SO U.S., 3 pp.

CODEN: USXXAM

DT Patent

LA English

IC C22D

NCL 204112000

CC 56 (Nonferrous **Metals** and Alloys)

FAN.CNT 1

	PATENT NO.	KIND	DATE	APPLICATION NO.	DATE
PI	US 3446720	A	19690527	US 1965-428585	19650127
AB	<p>A simple, economical, and efficient process is provided for sepg. Fe and other metallic impurities, particularly Zn, from aq. solns. of Ni and Co. E.g., anolyte from an electrorefining operation was treated to sep. Co, <b>Cu</b>, Fe, and Zn from Ni. This pH 1.4 soln. contained Ni 100, Co 1.9, <b>Cu</b> 0.010, Fe 0.14, Zn 0.010, Cl- 160, and SO<sub>4</sub>2- 60 g./l. The soln. was oxidized with Cl to convert Fe++ to the extractable Fe+++ state. <b>Cu</b>+, if present, also was oxidized to <b>Cu</b>++.</p> <p>The soln. was passed countercurrently through 3 mixer-settler extractors by using 0.2M dodecenylntrialkylmethylamine. <b>HCl</b> in aromatic solvent. An aq.-to-org. phase ratio of 2 was used. More than 95% of the Fe and Zn, &lt;0.001% of the Co and Ni, and 4% of the <b>Cu</b> were extd. The ext. phase was then stripped countercurrently with water, by using 3 mixer-settler units at an org.-to-aq. phase ratio of 12. The barren org. phase was recycled to the solvent extn. operation. The Fe-rich strip soln. contained, typically Fe 3.3, Zn 0.17, <b>Cu</b> 0.01, Co 0.06, and Ni 0.008 g./l. The Ni-bearing soln., freed of Fe and Zn, was passed countercurrently through a disk-type vertical extn. column equiv. to nearly 5 theoretical extn. stages, by using 0.5M triisooctylamine. <b>HCl</b> in aromatic solvent. An aq.-to-org. ratio of 1 was used.</p>				

Better than 99% of the Co and Cu were extd. from the Ni-bearing soln., which was then treated by electrolysis for recovery of high purity Ni. The Ni plated from soln. purified in this manner contained <100 ppm. of metallic impurities including Pb 10, Si 10, Si, Na <10, Al 5, As 5, Mg 4, Mo 4, Fe 3, Cu 1, and Co 0.2 ppm. The org. ext. stream from the mixer-settlers contained Co 1.9, Cu 0.01, and Ni <0.05 g./l. This was stripped countercurrently with water in 8 mixer-settlers at an org.-to-aq. ratio of 20 to give (1) a Co-free org. phase, and (2) a CoCl<sub>2</sub> soln. contg. Co 38, Cu 0.2, and Ni 0.3 g./l. The barren org. phase was recycled to the Co extn. operation and the CoCl<sub>2</sub> strip soln. was treated with Co metal to remove Cu by cementation. The decoppered soln. was treated electrolytically for recovery of Co metal which contained, typically, <200 ppm. of metallic impurities including Cu 100, Ni 29, Zn 20, Fe 18, and Na <10 ppm.

- ST nickel purifn; cobalt purifn; iron removal Ni Co  
 IT Naphtha  
 RL: PRP (Properties)  
 (as solvent in nickel recovery from waste electrolytes)  
 IT Dodecenyamine, alkyl derivs.  
 RL: USES (Uses)  
 (in recovery of nickel from waste electrolytes)  
 IT 25429-07-6  
 RL: USES (Uses)  
 (in recovery of nickel from waste electrolytes)  
 IT 7440-02-0P, preparation 7440-48-4P, preparation  
 RL: PREP (Preparation)  
 (recovery of, from waste electrolytes)  
 IT 7439-89-6, uses and miscellaneous 7440-66-6, uses and miscellaneous  
 RL: USES (Uses)  
 (sepn. of, in nickel recovery from waste electrolytes)
- L50 ANSWER 35 OF 42 HCAPLUS COPYRIGHT 2002 ACS  
 AN 1970:114437 HCAPLUS  
 DN 72:114437  
 TI Purification of cobalt chloride by solvent  
 extraction and by ion exchange chromatography.  
 Production and properties of high-purity cobalt  
 AU Dubois, Bernard; Rocquet, F.; Nardin, M.; Vu Quang Kinh  
 CS Lab. Met., Ecole Nat. Super. Chim., Paris, Fr.  
 SO Mem. Sci. Rev. Met. (1969), 66(9), 683-90  
 CODEN: MRMTAU  
 DT Journal  
 LA French  
 CC 56 (Nonferrous Metals and Alloys)  
 AB Fe is 1st extd. (.apprx.99%) into Me iso-Bu ketone from aq. CoCl<sub>2</sub>  
 (obtained by electrolytic dissoln. of 99.7% Co into aq. HCl)  
 with 1-6M HCl acidity. The CoCl<sub>2</sub> is then put onto the  
 Dowex 1-X8 anion exchange resin (200-400 mesh) in 6M HCl.  
 Washing the column with 6M HCl removes: Sc, Ti, V, Cr(III), Mn,  
 Ge, As(V), Zr, Ag, Th, Hf, W(VI), Ni, Pb, and Fe(II). Co<sup>3+</sup> is then eluted  
 with 3M HCl; Ga, Mo, Pd, Cd, Sn, Sb, Te, Pt, Au, Hg, Tl, Bi,  
 U(VI), Cu, Zn, and Fe(III) are retained on the column. After  
 the excess acid is evapd. from the exchange purified CoCl<sub>2</sub>  
 soln., the soln. is preelectrolyzed 1st at low c.d. eliminating impurities  
 more electropos. than Co<sup>2+</sup>, and then it is electrolyzed at 10 A/dm<sup>2</sup>  
 depositing .apprx.60% of the Co; both electrolyses are done at pH 3 and  
 50.degree.C. Low-temp. resistivity ratio (62 .times. 10<sup>-4</sup> for

20.3.degree.K/294.degree.K) detns. showed that the exchange purified, .gtoreq.99.998%, Co had 0.5 ppm Ni (reduced from an initial 1500 ppm Ni). After a 12-hr anneal at 1150.degree.C, purified Co could be cold-rolled to 80% thickness redn. without cracking, while unpurified Co only to 40-50%. X-ray diffraction and Vickers and Rockwell hardness measurements of Co, previously cold-rolled to 51% thickness redn., as a function of annealing temp. (100-800.degree.C) showed that purified Co recrystd. at 400.degree.C, and the u n-purified Co at 650.degree.C.

ST chlorides Co 2 purifn; cobalt 2 chlorides purifn; purifn Co 2 chlorides; deformability high purity Co; high purity Co prodn; crystn high purity Co; hardness annealing pure Co; annealing hardness pure Co

IT **7440-48-4P**, preparation

RL: **PREP (Preparation)**

(by electrolysis of purified **cobalt chloride**)

L50 ANSWER 36 OF 42 HCAPLUS COPYRIGHT 2002 ACS

AN 1969:483668 HCAPLUS

DN 71:83668

TI Adsorption of impurities by **ion exchangers** in neutral **nickel chloride** environment, purification of nickel(II) chloride, and preparation of high-purity nickel

AU Nardin, Mario; Wache, A. M.; Vu Quang Kinh

CS Centre Etudes Chim. Met., CNRS, Vitry, Fr.

SO Mem. Sci. Rev. Met. (1969), 66(4), 311-18

CODEN: MRMTAU

DT Journal

LA French

CC 54 (Extractive **Metallurgy**)

AB Carbonyl Ni was dissolved in 6N **HCl**. The acidic or neutral soln. was passed through static beds of anion-exchange resin Dowex 1 and cation-exchange resin Dowex 50W. After electrolysis with 10 amp./dm.2, Ni was detd. by radiotracer methods. A no. of impurity ions was better absorbed by the **ion exchangers** from neutral **NiCl2** soln. than from **HCl** soln. Analyses before and after purification in neutral medium are Co 7.9, not detectable; Fe 93, 2.3; **Cu** 37-60, 0.10; Mo -, 0.003; W -, 0.003 ppm. All other impurities are .ltoreq.0.1 ppm. The method is superior to zone melting, esp. for removing Co, Fe, and **Cu**. C is 40-1000 ppm. in the carbonyl Ni and was detd. to be 25-30 ppm. in the purified Ni.

ST nickel purifn; carbonyl Ni purifn; refining carbonyl Ni; **ion exchange** Ni chlorides; electrolysis Ni chlorides

IT Adsorption

(of impurities, from **nickel chloride** by **ion exchangers**)

IT **7440-02-0P**, preparation

RL: **PREP (Preparation)**

(**nickel chloride** purification for, by **ion exchange**)

IT **7718-54-9P**

RL: PUR (Purification or recovery); PREP (Preparation)  
(purification of, by anion exchange)

IT 7439-89-6, uses and miscellaneous 7440-48-4, uses and miscellaneous  
**7440-50-8**, uses and miscellaneous

RL: REM (Removal or disposal); PROC (Process)  
(removal of, from **nickel chloride** by **ion exchange**)

L50 ANSWER 37 OF 42 HCAPLUS COPYRIGHT 2002 ACS



AN 1969:59828 HCAPLUS  
DN 70:59828  
TI Recovery of nickel and cobalt from lateritic iron ore in a batch-fluidized bed  
AU Heertjes, Pieter M.; Jessurun, R. M. M.  
CS Tech. Univ. Delft, Delft, Neth.  
SO Proc. Int. Symp. Fluid. (1967), 688-700. Editor(s): Drinkenburg, A. A. H.. Publisher: Neth. Univ. Press, Amsterdam, Neth.  
CODEN: 20UBAZ  
DT Conference  
LA English  
CC 54 (Extractive Metallurgy)  
AB Lab. results are reported on a process for the selective conversion of hydrated oxides of Ni and Co in a lateritic Fe ore into their chlorides and subsequent **extn.** of these chlorides with H<sub>2</sub>O. The process is based on the difference in stability of NiCl<sub>2</sub>, **CoCl<sub>2</sub>**, and FeCl<sub>3</sub> in the presence of gaseous H<sub>2</sub>O and **HCl**. By the proper choice of the ratio of H<sub>2</sub>O to **HCl** and the temp., a selective conversion of the oxides can be achieved in which NiO and CoO are converted into NiCl<sub>2</sub> and **CoCl<sub>2</sub>**, resp., whereas Fe<sub>2</sub>O<sub>3</sub> gives no H<sub>2</sub>O-sol. products. The process is carried out batch-wise in a fluidized bed, using granules of the laterite and a mixt. of steam and **HCl** as the fluidizing gas. The effects of the roasting temp. prior to chloridization, the time of reaction, the ratio **HCl**/H<sub>2</sub>O, the flow rate of the fluidizing gas, and the height of the bed on the selectivity of the conversion were examd. Preheating the laterite at **high temp.**, prior to chlorination, decreases the recovery of Ni. It is advisable to dry the wet granules at 100-110.degree. to remove the greater part of the water. The higher the percentage of **HCl** in the reaction gas, the higher the reaction rate. Care must be taken to prevent the granules from sticking together when high partial pressures of **HCl** are used. The optimum working conditions are with a **HCl**/H<sub>2</sub>O ratio of 45/55. Varying the gas flow rate does not show a marked influence on the final recovery. The best results are at a value twice the incipient fluidization flow. A bed height equal to the reactor diam. gives optimum results. The existence of at least 3 Ni and 2 Co compds. in the laterite was found. One Ni compd. does not react with **HCl**; a 2nd keeps its reactivity when heated a long time at 400.degree. prior to chlorination; while a 3rd is affected by heating prior to and during chlorination. The recovery of the 2nd Co compd. is not influenced by preroasting. The compd. appears to be deactivated in the presence of **HCl** and steam at 230.degree..  
ST lateritic Fe ores; iron ores lateritic; nickel recovery Fe ores; cobalt recovery Fe ores; chlorination Ni Co  
IT 7440-02-0P, preparation **7440-48-4P**, preparation  
RL: **PREP (Preparation)**  
(from lateritic iron ores by chlorination in fluidized bed)  
L50 ANSWER 38 OF 42 HCAPLUS COPYRIGHT 2002 ACS  
AN 1970:5340 HCAPLUS  
DN 72:5340  
TI Metallurgy of cobalt in a chloride medium  
AU Tougarinoff, B.; Willekens, M.; Van Peteghem, A.  
CS Met. Hoboken, Hoboken, Belg.  
SO Ind. Chim. Belge (1967), 32(Spec. No.)(Pt. 2), 169-73  
CODEN: ICBEAJ  
DT Journal

LA French  
 CC 54 (Extractive **Metallurgy**)  
 AB Finely ground Ni-Co raw oxides, roasted mattes, or speiss were attacked in 2 stages by aq. **HCl**, first with 10 and then with 100 g/l., both for 2 hr at 95.degree.. The final soln. contained 10 g **HCl**/l. The metal concns. and the yields, resp., were: Co 44-80, 97.30-99.10; Ni 13-60, 96.60-98.60; Fe 21-50, 87.50-100; As 8-39, 72.60-98.10; and **Cu** 9 g/l., 84%. Precious metals and the last 1-10% of the Ni and Co may be recovered if these are subjected to an addnl. roast and subsequent treatment. Massive pieces of refractory metal scrap were attacked by **HCl** + Cl. **HCl** under O pressure is an attractive method of attack of complex materials such as speiss and various residues, since it permits the elimination As, Fe, Cr, and Al as insol. arsenates. Pptd. precious metals may be recovered from the arsenate ppt. Refractory alloy scrap contg. Co 29, Ni 24, Fe 15, Cr 14, Mo 2.50, W 0.50, and **Cu** 0.50% was dissolved by anodic attack in 6N **HCl** for 25 hr until the acid was neutralized. The cell operated at 50.degree. and with a c.d. of 1500 A/m<sup>2</sup>. Metal concns. and yields, resp., were: Co 52, 99.70; Ni 38, 99.80; Fe 26, 99.30; Cr 19, 95; Mo 1.50, 95; W 0.10, 14; and **Cu** 0.40 g/l., 90%. Dry chlorination of these materials at 1100.degree. with 10% excess Cl produced 100% metal yields, and chlorination below 1000.degree. resulted in the same distribution of the metal chlorides, with the exception that **NiCl<sub>2</sub>** and **CoCl<sub>2</sub>** were not volatilized.

ST cobalt recovery; nickel recovery; leaching Ni Co; iron recovery; chromium recovery; molybdenum recovery; tungsten recovery; **copper** recovery; scrap metals recovery

IT 7439-89-6P, preparation 7440-02-0P, preparation 7440-38-2P, preparation 7440-48-4P, preparation 7440-50-8P, preparation

RL: **PREP (Preparation)**  
 (from alloy scrap by leaching with **hydrochloric acid**)

L50 ANSWER 39 OF 42 JAPIO COPYRIGHT 2002 JPO  
 AN 2001-020021 JAPIO  
 TI **MANUFACTURE OF HIGH PURITY COBALT**  
 IN NAGAO JUNKO; SEKINE SUSUMU; TANAKA MINORU; YOKOYAMA HIDECHIKA  
 PA KOJUNDO CHEM LAB CO LTD  
 PI JP 2001020021 A 20010123 Heisei  
 AI JP 1999-224389 (JP11224389 Heisei) 19990702  
 PRAI JP 1999-224389 19990702  
 SO PATENT ABSTRACTS OF JAPAN (CD-ROM), Unexamined Applications, Vol. 2001  
 IC ICM **C22B023-00**  
 ICS C01G051-08; C25C001-08

AB PROBLEM TO BE SOLVED: To efficiently **manufacture** a high purity **cobalt** minimal in metallic impurity content.  
 SOLUTION: Among metallic impurities, such as iron, zinc, tin, nickel, calcium, sodium, and magnesium, which are contained in an aqueous solution of **cobalt chloride** as a raw material, that which forms a chloride complex together with chloride ions is represented by the group A impurity and that which forms no chloride complex together with chloride ions is represented by the group B impurity. The impurities are efficiently removed by means of a first step where the group A impurity is removed by bringing the aqueous solution of **cobalt chloride** into contact with an anion-exchange **resin** and a second step where the group B impurity is removed by using an aminic organic solvent extraction agent. The resultant high

purity aqueous solution of **cobalt chloride** is concentrated, dried and solidified, and then subjected to reduction in a hydrogen air flow or to electrolytic reduction. By this method, the high purity **cobalt** can be **manufactured**.

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- L50 ANSWER 40 OF 42 METADEX COPYRIGHT 2002 CSA  
 AN 1970(4):43-46 METADEX  
 TI PURIFICATION OF COBALT CHLORIDE BY SOLVENT EXTRACTION AND BY ION-EXCHANGE CHROMATOGRAPHY. PRODUCTION AND PROPERTIES OF HIGH-PURITY COBALT.  
 AU DUBOIS, B ; ROCQUET, F ; NARDIN, M ; KINH, VU QUANG  
 SO MEM SCI REV MET, SEPT. 1969, 66, -9-, 683-690.  
 LA FRENCH  
 CC 43 REFINING AND PURIFICATION  
 CT COBALT: EXTRACTION; ELECTROREFINING; ION EXCHANGING; SOLVENT EXTRACTION
- L50 ANSWER 41 OF 42 METADEX COPYRIGHT 2002 CSA  
 AN 1969(10):43-204 METADEX  
 TI APPLICATIONS OF ION EXCHANGE FOR THE PURIFICATION OF NICKEL AND THE PREPARATION OF HIGH-PURITY NICKEL.  
 AU NARDIN, M ; WACHE, A M ; KINH, VU QUANG  
 SO MEM SCI REV MET, APR. 1969, 66, -4-, 331-320.  
 LA FRENCH  
 CC 43 REFINING AND PURIFICATION  
 CT NICKEL COMPOUNDS: REFINING; PURIFICATION; ION EXCHANGING
- L50 ANSWER 42 OF 42 WPIX (C) 2002 THOMSON DERWENT  
 AN 1972-75307T [47] WPIX  
 TI High purity nickel prodn - from sulphurated nickel concentrates using quaternary ammonium anion **exchange resins**.  
 DC M28  
 PA (NICKEL) LE NICKEL  
 CYC 9  
 PI BE 783430 A (197247)\*  
 NL 7206995 A (197250)  
 DE 2225240 A (197251)  
 ZA 7203430 A (197310)  
 FR 2138332 A (197312)  
 DE 2225240 B (197338)  
 GB 1370259 A 19741016 (197442)  
 US 3840446 A 19741008 (197442)  
 CA 970574 A 19750708 (197530)  
 JP 48000224 A 19730105 (197943)  
 JP 54029969 B 19790927 (197943)  
 PRAI FR 1971-18633 19710524; FR 1972-40112 19721113  
 IC C22B009-08; **C22B023-04**; C22D001-14  
 AB BE 783430 A UPAB: 19930831  
 Process for producing high purity nickel from sulphurated concentrates comprising (a) drying and roasting the concentrates at about 900 degrees C (b) dissolving in **hydrochloric acid** (c) oxidising the iron contained in the soln. obtained (d) removing impurities in a strongly basic quaternary ammonium anion **exchange resins** (e) neutralising the slight excess of **hydrochloric acid** (f) electrolysing the **purified nickel chloride** soln. High purity **nickel** is produced at reduced cost. The process uses very small amts. of purifying reagents. **Copper**, cobalt iron and zinc can be additionally recuperated.  
 FS CPI